LLOYDS REGISTER OF SHIPPING

RULES & REGULATIONS

FOR THE

CONSTRUCTION AND CLASSIFICATION OF STEEL VESSELS

PRIVATE AND CONFIDENTIAL

(For the information of Surveyors to the Society only)

LLOYD'S REGISTER OF SHIPPING.

INTERPRETATIONS OF THE RULES,

1922-23 EDITION.

No. 1.

December, 1922.

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INTERPRETATIONS OF THE RULES,

1922-23 EDITION.

Memorandum for the guidance of Surveyors to Lloyd's Register who are authorised to approve plans on behalf of the Society.

(1) SIDE FRAMING.

(*a*) **Arrangement and Scantlings of Frames in 'Tween Decks. Section 6, Clause 4.**

The Rules permit the omission of intermediate frames in the bridge 'tween decks where the Rule spacing of frames does not exceed 30 inches amidships, and in the upper 'tween decks of complete superstructure vessels amidships.

The question has been raised as to what arrangement and what standard of strength is to be adopted when the frame spacing given in the Tables is greater than 30 inches.

An enquiry has also been made as to the procedure to be adopted when the spacing required by the Rules is below 30 inches, but has been increased beyond this figure.

Sketches (Figures 1, 2 and 3) have been prepared which show clearly the arrangement of framing which can be adopted in these various cases together with the standard of strength which should be secured in each instance.

(*b*) **Tankside Brackets.**

When the height of these brackets is increased beyond the Rule requirements, the Committee's practice of allowing one half of the excess height to be deducted from the dimension "d" is to be continued.

(*c*) **Exterpolation.**

For values of "d" less than 8 and for values of the proportion of length to depth (L/D), less than 10, exterpolation can be allowed.

(*d*) **Framing at Fore End where Frame Spacing is reduced Amidships.**

Care is to be taken to ensure that the standard of strength represented by the tabular requirements for frames forward of the $\frac{3}{5}$ths length is maintained.

For Example:—If the Rule spacing is 30 inches and this has been reduced to 27 inches amidships, the modulus of the frames fitted between the collision bulkhead and $\frac{3}{5}$ths of the vessel's length from forward is to be increased in the ratio of 30 : 27.

(2) BEAMS.

(*a*) **Beams of Upper Decks from which Chilled Meat is suspended. Section 15, Clause 1 (*e*).**

The scantlings of these beams need not exceed those of cargo beams which have been increased for this purpose.

(*b*) **Beam Knees. Section 15, Clause 3 (*d*).**

The dimensions of the beam knees given in this paragraph are to be measured from the top of the beam and the outside of the frame respectively.

(*c*) **Beams forward of the $\frac{3}{5}$ths Length from forward.**

The scantlings of beams as fitted amidships are not to be reduced forward of the $\frac{3}{5}$ths length or in the fore and after peaks, in respect of the spacing at these parts being less than the Rule spacing amidships.

(*d*) **Beams in Forecastles in Complete Superstructure Vessels. 2nd Column, Tables 12 & 13,** sets forth the size of beams at Upper Decks in Complete Superstructure Vessels forward of the $\frac{1}{8}$th length from forward.

In cases where a forecastle is fitted on the "Upper" deck, the beams of the upper deck inside the forecastle need not be taken from this column, but may be of the size given in column 3 for beams at upper decks abaft the $\frac{1}{8}$th length from forward.

(*e*) **Beams at Crown of Deep Tanks. Section 19, Clause 3 (*a*). Section 20, Clause 7 (*a*).**

In the case of a deep tank having a relief valve fitted not more than 2 feet above the crown of the tank, the scantlings of the beams of the tank deck need not exceed those required for the beams of cargo decks.

(3) DECKS.

(*a*) **Second Deck Plating at Ends with Beams fitted at Alternate Frames. Section 13. Clause 1 (*g*).**

(I.) The thickness of the plating at the ends is to be ·06 inch greater than required by Table 26 at ends.

(II.) The thickness of the stringer plates is to be ·04 inch greater than thickness of deck plating.

(*b*) **Thickness of Plating abreast of Openings on Lower Decks. Section 13, Clause 1 (*g*).**

This Clause provides that when beams are fitted to alternate frames, the thicknesses of decks required by the Rules at the side of all deck openings is not to be less than ·44 inch This thickness should be maintained throughout the length of the vessel, abreast of deck openings, where beams are fitted at alternate frames.

(*c*) **Steel Lower Decks. Section 13, Clause 4 (*a*).**

(I.) Where decks not required by the Rules are sheathed, the thicknesses given in paragraph (*a*) may be reduced to ·30 inch for decks with beams fitted at alternate frames and ·28 inch for beams fitted at every frame.

(II.) The minimum thickness for unsheathed steel lower decks not required by the Rules and supported by beams at alternate frames is to extend fore and aft.

(III.) The thickness of stringer plates at decks not required by the Rules is to be ·04 inch in excess of the thickness of the deck plating.

(*d*) **Plating of Steel Lower Decks.**

The thickness of all steel lower decks below the 2nd deck, inside the line of openings, is to be the thickness given in Table 26 for deck plating at ends.

(*e*) **Thickness of Stringer Plates with Wide Frame Spacing. Section 14, Clause 7 (*b*).**

The requirements of this Section are not to be applied to stringer plates.

(*f*) **Thickness of Steel Decks where Wood Composition is laid. Section 14, Clause 7 (*d*).**

The concession permitted by this paragraph can only be adopted if the thickness of the wood composition is equal to the thickness of the wood deck which it has displaced. Where this is not so, the additions to the thickness of the steel deck indicated in the Clause should be made operative.

(*g*) **Deck Plating forming Crowns of Deep Tanks. Section 19, Paragraph 3.**

If the deck plating forming the crown of a deep tank be sheathed, the thickness is to be as required by the Rules for the plating of the boundary bulkheads, or as required by the Tables for deck plating whichever of these is the greater.

The same procedure may be adopted in the case of the crown of deep oil fuel tanks.

(*h*) **Minimum Thicknesses of Steel Decks on Forecastles, Short Bridges and Poops. Section 22, Clause 1.**

These thicknesses are to be as follows :—

Beams at every frame.			Beams at alternate frames.
Unsheathed	-	·30	·34
Sheathed	-	·26	·30

(4) PILLARS.

(*a*) **Closely Spaced Pillars under Passenger Accommodation. Section 16, Clause 2 (*f*).**

This Clause sets forth the reductions which can be made in the diameters of pillars which support decks intended exclusively for the accommodation of passengers. Cases arise in which one or more decks are intended for the accommodation of passengers, and the remainder for cargo purposes. In such cases the reduction permitted in the diameter of the pillars is to represent the actual loads carried, taking as a basis the figures given in this paragraph.

(*b*) **Closely Spaced Pillars at Ends**

Closely spaced pillars at the ends of vessels may be reduced in proportion to reduction of load arising from variation of breadth. A reduction may also be made on the same basis to the stiffeners of the middle line bulkheads at the ends of the vessel.

(*c*) Solid Pillars spaced more than two Frame Spaces apart.

Where solid pillars are fitted more than two frame spaces apart, the diameters are given in the following Table, the numerals being calculated as in **Section 16** for widely spaced pillars. The number of rivets to be fitted in the heads and heels of these pillars is also given in the Table:

DIAMETERS OF WIDELY SPACED SOLID PILLARS FITTED IN 'TWEEN DECKS.

Values of $\frac{S \times B \times H}{100}$	Length of Pillar.			
	8 feet.		10 feet.	
	Diameter.	Number of $\frac{7}{8}$ in. rivets in heads and heels.	Diameter.	Number of $\frac{7}{8}$ in. rivets in heads and heels.
	Inches.		Inches.	
7	3	4	$3\frac{1}{4}$	4
9	$3\frac{1}{4}$	4	$3\frac{1}{2}$	4
11	$3\frac{1}{2}$	4	$3\frac{3}{4}$	4
13	$3\frac{3}{4}$	4	4	4
16	4	4	$4\frac{1}{4}$	5
19	$4\frac{1}{4}$	5	$4\frac{1}{2}$	5
22	$4\frac{1}{2}$	5	$4\frac{3}{4}$	5
25	$4\frac{3}{4}$	5	5	6
29	5	6	$5\frac{1}{4}$	6
33	$5\frac{1}{4}$	6	$5\frac{1}{2}$	7
37	$5\frac{1}{2}$	7	$5\frac{3}{4}$	7
42	$5\frac{3}{4}$	7	6	8
47	6	8	$6\frac{1}{4}$	8
52	$6\frac{1}{4}$	8	$6\frac{1}{2}$	8
58	$6\frac{1}{2}$	8		

Supports under Pillars. Section 16, Clause 3 (*c*).

Where loads of considerable magnitude are transmitted by pillars to their supports, such as occur, for example, in vessels where cargo is suspended from the beams in addition to the normal load thereon, the pillars are to be fitted with their *centres* over the intersection of floor and continuous intercostal girder of the double bottom.

In all cases, the heads and heels of such pillars are to have a good bearing fit.

(5) DOUBLE BOTTOMS.

(*a*) Gusset Attachments to Double Bottom. Section 10, Clause 7 (*b*) and Table 8.

Where a value of "*d*" comes between numerals requiring—by Table 8—gussets to be fitted at every 3rd and every 2nd frame respectively, the procedure to be adopted is to interpolate between the total number of rivets required in each case. The gussets can then be fitted at every 2nd frame with a reduced number of rivets, or at every 3rd frame with an increased number.

(*b*) **Connection of Centre Girder to Keel Plate and Double Bottom. Section 10, Clause 2.**

It is sometimes desired to connect the centre girder to the keel plate and to the inner bottom plating by single angles having two rows of rivets in each flange.

This may be done in vessels not exceeding 400 feet in length, except in way of the engine space and from the $\frac{3}{5}$ths length forward to the Collision Bulkhead. In way of the engine space and from the $\frac{3}{5}$ths length forward to the Collision Bulkhead, double bars are to be fitted connecting the centre girder to the inner bottom plating; from the $\frac{3}{5}$ths length forward to the Collision Bulkhead, double bars are to be fitted connecting the centre girder to the keel plate. The flanges of the double-riveted bars are to be of a sufficient width to take two *complete* rows of rivets, and the thickness need not be increased beyond that given in the Tables.

(*c*) **Connection Angles.**

In **Table 6** of the Rules, certain connection angles are specified to have 4 × 4 flanges and in a few cases it happens that the rivets required for these bars are $\frac{7}{8}$ of an inch in diameter. In such cases the widths of the flanges could be reduced to $3\frac{1}{2}$ × $3\frac{1}{2}$ without any increase in thickness.

(*d*) **Increased Thicknesses in Boiler Room. Table 7, Footnote 2.**

The increase specified in the thickness of bars in the boiler space is to be applied to bulb angle frames in the double bottom.

(*e*) **Modifications for Reduced Frame Spacing.**

The following reductions may be made, provided the reduction from the Rule frame spacing does not exceed 6 inches :—

(I.) **Inner Bottom Plating** :—·01 inch for each *complete* 2 inches reduction of spacing.

(II.) **Bulb Angle Frames and Reversed Frames**:—Modulus reduced in proportion to frame spacing.

(III.) **Floors and Intercostals** :—·01 inch for each *complete* 2 inches reduction of spacing.

(6) SHELL PLATING.

(*a*) **Flat Plate Keels. Section 4, Clause 3.**

No reduction in the thickness of flat plate keels is to be permitted on account of increased breadth.

(*b*) **Sheerstrake. Section 12.**

The thickness may be reduced in respect of increased breadth, provided the same total sectional area be maintained.

(*c*) **Bridge Side Plating. Section 14, Clause 4.**

(I.) The thickness of the bridge side plating is to be increased by the same amount as the shell plating where the frame spacing exceeds the Tabular figures.

(II.) **Section 22, Clause 2** (*b*). The riveting of the seams of the bridge side plating need not exceed the riveting of the side shell plating.

(*d*) **Modifications for Reduced Frame Spacing.**

Provided the reduction from the Rule frame spacing does not exceed 6 inches, the shell plating may be reduced ·01 inch for each *complete* 1 inch reduction of spacing.

The shell plating on flat of bottom forward is to be of the Tabular thickness.

(7) BULKHEADS.

(*a*) **Stiffeners on Watertight Bulkheads. Section 17, Clause 5 (*c*).**

The upper brackets on the stiffeners are to be connected to angles which extend for a beam space when beams are fitted either at every frame or alternate frames. In the latter case the vertical flanges of these angles are to be increased in depth by 1 inch.

(*b*) The scantlings of stiffeners which are bracketed at one end, and lugged at the other, may be taken as a mean between those given in Tables 27 and 28.

(8) LENGTHS OF ERECTIONS, THE HEIGHTS OF WHICH IS LESS THAN THE STANDARD

Tables 20, 21, and 22.

The length of erection should be multiplied by a factor represented by the ratio of the actual height of the erection to the standard height given in the Freeboard Regulations, observing that no allowance is to be made for any excess above the standard height.

(9) REDUCED FRAME SPACING.

Section 14 of the Rules deals with cases in which the frame spacing has been increased beyond the Tabular requirements. Proposals are sometimes made, however, to reduce the frame spacing below these requirements, andin such instances the following reductions may be made from the scantlings given in the Tables; the reductions are to apply only to cases in which the Rule spacing is decreased by not more than 6 inches :—

(I.) **Shell Plating** reduced ·01 inch for each ~~complete~~ 1 inch reduction of spacing.

(II.) **Inner Bottom Plating** reduced ·01 inch for each ~~complete~~ 2 inch reduction of spacing.

(III.) **Frames.** The frame modulus reduced in proportion to the spacing.

(IV.) **Bulb Angle Frames and Reverse Frames in Double Bottom.** Modulus reduced in proportion to the spacing.

(V.) **Deck Beams.** Modulus of section reduced in proportion to the spacing.

(VI.) **Floors and Angles in Double Bottom** reduced ·01 inch for each 2 inch reduction in spacing.

Care is to be taken to ensure that the standard of strength represented by Section 11 for Additional Strengthening of the Fore Part of the Bottom is complied with, and the shell plating also on the flat of the bottom forward is to be of the Tabular thickness.

With regard to the frames, a similar course is to be followed :—

For Example:—If the Rule spacing is 30 inches, and this has been reduced to 27 inches amidships, the modulus of the frames fitted between the Collision Bulkhead and the $\frac{3}{5}$ths of the vessel's length from forward is to be ~~increased~~ in the ratio of 30 : 27.

(10) AFTER PEAK.

The stringer plates in after peaks may be attached to the outside plating by single angles.

(11) SHAFT TUNNELS IN DEEP TANKS.

Section 19, Clause 5. Section 20, Clause 4.

The tunnels in way of deep tanks may be attached to the inner bottom plating by single angles. In oil fuel tanks these angles are to be 5 inches × 5 inches.

(12) FORECASTLES.

(*a*) **Additional Sheer in respect of omission of Forecastle. Section 22, Clause 1 (*b*).**

Where the conditions of service may necessitate the omission of the Forecastle, the additional sheer, which is to be of a gradual character, is to be such as will provide a height H in feet from the water line to the upper deck at the stem ; where :—

$$H = \cdot 04L + 4$$

and — L is the length of the vessel in feet.

(*b*) **In Trawlers and Tugs. Section 22, Clause 1 (*b*).**

Trawlers and tugs are not required to have forecastles fitted, provided the "sheer" has the usual character.

(*c*) **Minimum Thickness of Steel Decks on Forecastles, Short Bridges and Poops.**

Beams at every frame.		Beams at alternate frames.
Unsheathed	·30	·34
Sheathed	·26	·30

(13) VENTILATORS.

Section 26.

Where a system of mechanical ventilation is adopted, the construction of the trunks, fan casings and so forth, placed on the weather decks, is to be submitted to this Office for approval.

(14) INTERPOLATION.

Section 41, Clause 2.

Scantlings may be approved to thicknesses of ·01 inch, if desired.

(15) VESSELS HAVING PROPORTIONS OF LENGTH TO DEPTH EXCEEDING 13½.

The following method is to be adopted in determining the scantlings :—

(I.) Find the depth which would give a proportion of Length to Depth equal to 13½ and corresponding draught.

(II.) Calculate the Moment of Inertia of the Rule Midship Section having this depth, and divide by the draught found in (I.).

(III.) The scantlings of the proposed vessel are to be such that the Moment of Inertia divided by the draught is to be the same as found in (II.).

NOTES REGARDING SKETCHES, FIGURES 1, 2 & 3.

1.—(*a*) Where a bridge is fitted in a complete superstructure vessel, the scantlings and arrangement of the side frames in the bridge are to be the same as required in the upper 'tween decks clear of the bridge, and the frames in the upper 'tween decks in way of the bridge are to be fitted on every frame.

(*b*) The basis of the scantlings of the frames is to be as indicated on the profile sketches and the scantlings and arrangement of the frames required in the upper 'tween deck in way of the bridge is to extend to the 2nd frame beyond each end of the bridge.

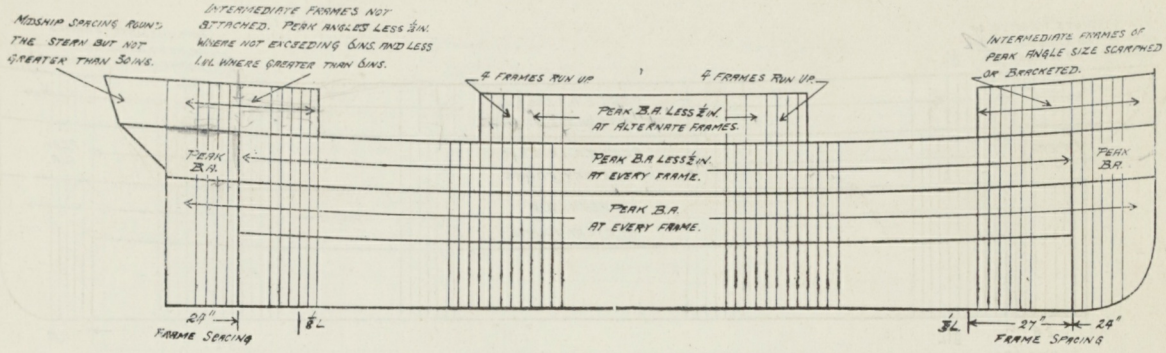
(*c*) Where a forecastle is fitted, the scantlings and arrangement of the framing in the upper 'tween decks in way of the forecastle are to be the same as required above in way of a bridge.

2. Where an upper bridge is fitted above a normal bridge deck, the side framing of the upper bridge is to be as required for the lower bridge. The side framing of the lower bridge is to be as already specified, with the addition of substantial webs at intervals, or equivalent strengthening.

FIGURE 1.

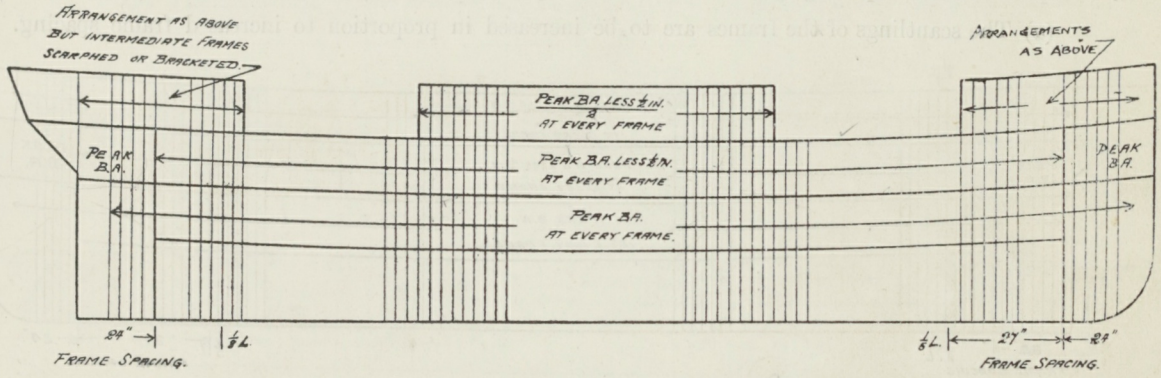
FULL SCANTLING VESSELS.

1. **Proposed Frame Spacing same as Rule Spacing and not exceeding 30 inches.**



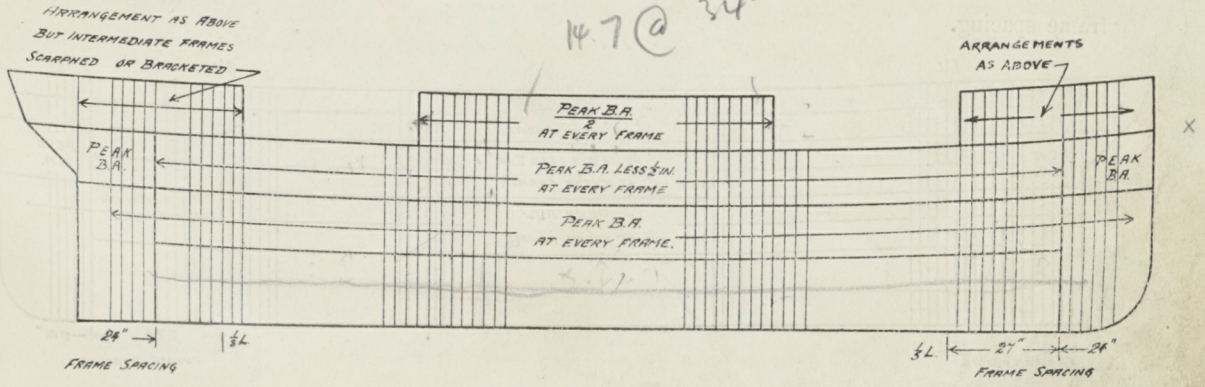
2. **Proposed Frame Spacing greater than Rule Spacing (latter not exceeding 30 inches).**

(*a*) The scantlings of the frames are to be increased in proportion to increased frame spacing.



3. **Proposed Frame Spacing same as Rule Spacing and both exceed 30 inches.**

(*a*) Where the proposed frame spacing is greater than rule spacing the arrangement of the framing is to be as in sketch below but the scantlings are to be increased in proportion to increased frame spacing.



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INTERPRETATIONS OF THE RULES,

1922-23 EDITION.

NOTE.—*In this Number the interpretations are arranged to follow the same order as the Rules for Steel Vessels.*

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INTERPRETATIONS OF THE RULES, 1922-23 EDITION.

Memorandum for the guidance of Surveyors to Lloyd's Register who are authorised to approve plans on behalf of the Society.

SECTION 3. DETERMINATION OF SCANTLING NUMERALS.

Depth (D). Clause 1 (c).

In vessels having tonnage openings in which the depth of 'tween decks is abnormal, say 7 feet or 9 feet, the depth (D) is to be taken to an assumed position 7 feet 6 inches above the freeboard deck in vessels up to 300 feet in length and 8 feet in vessels exceeding 300 feet in length.

For the determination of the proportion of length to depth, the actual depth to the upper deck is to be taken.

Where there is no tonnage opening, the depth (D) should in all cases be taken to the upper deck.

SECTION 5. RUDDERS.

(*a*) **Breadth of Arms. Clause 3. Table 43.**

The breadth of rudder arms is to be maintained without reduction throughout the length of the arm.

(*b*) **Couplings. Clause 4.**

The Rules do not require keys to be fitted in rudder couplings.

SECTION 6. SIDE FRAMING.

(*a*) **Arrangement and scantlings of Frames in 'Tween Decks. Section 6. Clauses 3 and 4.**

Where a vessel is designed with a poop and bridge combined extending over a considerable part of the vessel's length, the requirements of Clauses 3 (*b*) and 4 (*b*) for Complete Superstructure vessels are to be applied.

Where the standard height of 'tween decks is exceeded by more than 6 inches, the scantlings of the 'tween deck frames are to be increased directly as the 'tween deck height.

Web frames are not required by the Rules in the 'tween decks of Complete Superstructure vessels above watertight bulkheads.

In the sketches given in the "Interpretation of the Rules, No. 1," showing arrangements of frames in 'tween decks, it should be noted that the differences in the scantlings and arrangements therein indicated, following upon variations of the frame spacing, do not apply to the fore and aft peaks when the frame spacing of 24 inches is compulsory, nor forward of the $\frac{3}{5}$ths length to the collision bulkhead, where the frame spacing of 27 inches is compulsory.

In regard to the same sketches, a question has been raised as to the practice to be followed where the frame spacing is greater than the rule requirement by a small amount or is greater than 30 inches. In such cases the following procedure should be adopted where applicable:—

(1) Where the frame spacing exceeds 30 inches, frames are to be fitted in the 'tween decks at every frame.

(2) Where the frame spacing exceeds the rule requirement by not more than 3 inches, and does not exceed 30 inches, the intermediate frames in the 'tween decks may be omitted, subject to an increase in the thickness of the side plating. The thickness of the side plating is to be increased ·02 inch for every half inch increase of spacing beyond the requirement of the Rules.

(*b*) **Increased Thickness of Framing in Boiler Rooms and Permanent Bunkers.**

Increases required by the Rules to the thickness of the frames in boiler rooms and permanent coal bunkers are required in 'tween deck spaces where these are permanently used as bunkers.

(*c*) **Heel Pieces.**

Heel pieces need not be fitted in vessels with single bottoms.

SECTION 7.

(*a*) **Thickness of Shell Angles. Clause 2 (*d*).**

The thickness of the angles connecting side stringers and web frames to the outside plating is not to be less than the thickness of the side stringer or web frame respectively.

(*b*) **Attachment of Webs to Margin Plate. Clause 2 (*e*).**

Where the depth of the web frames exceed 30 inches, the double angles to the margin plate are required to have flanges of sufficient breadth to take two rows of rivets. In way of each web frame the floors are to be connected by double angles, having the fore and aft flanges of the same width as those of the angles outside.

SECTION 8. FLOORS IN SINGLE BOTTOM VESSELS.

(*a*) **Omission of Brackets. Clause 2 (*c*).**

In some cases it is desired to omit the brackets required to be fitted at the bilge. The brackets may be omitted provided the floors be increased three inches in depth. Where brackets are omitted the framing depth (*d*) is to be increased by an amount equal to half the depth of the bracket required by the Rules, except in the case of trawlers and tugs.

(*b*) **Flanging of Floors. Clause 3 (*d*).**

This Clause requires that where floors are flanged on their upper edges the thickness of the floors is to be increased ·02 inches.

This requirement is not to be applied to Trawlers and Tugs, Section 38, 2 (*a*), where flanging is permitted without an increase of thickness.

SECTION 9. KEELSONS IN VESSELS HAVING SINGLE BOTTOMS.

Side Keelsons. Clause 4.

A single keelson angle may be fitted instead of the double angles required by Table 10, provided the sectional area of the single bar be made equal to that of the double bars. The single angles should be increased ·10 inch in thickness in the boiler space.

In single bottom vessels any modified arrangement of side and centre keelsons may be adopted, provided the sectional area of the longitudinally continuous material be maintained and efficient riveted attachments secured.

SECTION 10. DOUBLE BOTTOMS.

(*a*) **Connection of Centre Girder to Double Bottom. Clause 2.**

In vessels not exceeding 250 feet in length, the angles attaching the centre girder to the inner bottom plating are to be double throughout the engine room and underneath the thrust seating.

(*b*) **Floors. Clause 4.**

Where open floors are fitted for any part of the vessel's length, these floors are to have the scantlings given in Table 9.

Floors in fore and aft peaks are to have the thickness given in Table 6.

The Rules do not require solid floors to be fitted to take the outer ends of brackets which connect bulkhead stiffeners to the inner bottom plating.

(*c*) **Bracket Floors in Double Bottom. Table 7.**

The attachments of the bulb angle frames and reverse frames to brackets and struts are to comply with the following table :—

NUMBER OF RIVETS IN BRACKET FLOORS IN DOUBLE BOTTOMS.

Depth of Bulb Angle Frame.	Number and Size of Rivets in Brackets.	Number and Size of Rivets in each end of vertical bar on intercostal.
Inches.		
5 and $5\frac{1}{2}$	5 at $\frac{3}{4}$	2 at $\frac{3}{4}$
6 „ $6\frac{1}{2}$	6 „ $\frac{3}{4}$	2 „ $\frac{3}{4}$
7 „ $7\frac{1}{2}$	7 „ $\frac{3}{4}$	3 „ $\frac{3}{4}$
8 „ $8\frac{1}{2}$	8 „ $\frac{3}{4}$	4 „ $\frac{3}{4}$
9 „ $9\frac{1}{2}$	8 „ $\frac{7}{8}$	4 „ $\frac{7}{8}$
10 „ above	9 „ $\frac{7}{8}$	4 „ $\frac{7}{8}$

Where frames and reversed frames are angles, the number of rivets may be as required by the above table for 5-inch bulb angles.

Where the length of bracket is greater than that required by the Rules, the rivets are to be so spaced as to close the work satisfactorily.

In any case the number of rivets is to be sufficient to close the work efficiently.

(*d*) **Inner Bottom Plating. Clause 6 (*a*).**

The Rules provide that the inner bottom plating is to be continuous longitudinally, with the exception that transverse plates below watertight bulkheads may be fitted between the margin plates and the middle line strakes. The attachment of the transverse plates to the longitudinal inner bottom plating is to comply with the requirements of Table 39, providep that double riveting at least is required.

(*e*) **Tankside Brackets. Clause 8 (*a*). Scarph of Main Frames.**

The length of scarph of the main frames to the tankside brackets should be sufficient to permit a reasonable disposition of the rivets required by Section 10, Clause 8 (*b*) of the Rules. In any case a sufficient number of rivets is to be fitted to close the work efficiently.

(*f*) **Tank Side Brackets and Angles. Clause 8 (*b*).**

In vessels of relatively great depth of hold, the efficiency of the attachment of the frames to the margin plate is particularly important. Where the framing depth (*d*) exceeds 26 feet, and the attachment outside the margin plate required by Table 8 consists of double angles, the floor plate is also to be connected to the margin plate by double angles of the same width of flanges. Where a single angle double riveted is fitted outside the margin plate, the fore and aft flange of the angle fitted inside is to be of the same width as that of the external bar.

(*g*) **Increased Thickness in Machinery Space. Clause 9.**

The increased thickness is required throughout the boiler space, including any donkey boiler recess.

Where machinery is fitted aft, the thicknesses given in Table 6 for inner bottom plating in engine room are to be adopted throughout the engine room. In the boiler room the thicknesses are to be increased by the increments which would have been added if the machinery had been fitted amidships.

SECTION 12. SHELL PLATING.

Breadth of Strakes. Clause 1 (*e*)

This Clause requires suitable compensation where the breadth of shell plates is excessive, and the question has been raised as to the limit of width of shell plates which can be approved without compensation. Clause 2 contains the minimum requirements for a proper shift of butts, and compensation is to be provided when this standard is not obtained.

SECTION 13. DECKS.

(*a*) **Thickness of Strength Deck. Clause 1** (*c*)

The thicknesses of deck plating prescribed in the Rules allow for a tumble-home of 6 inches. Where the tumble-home exceeds this figure the thickness is to be increased to give the same area of deck plating which would be required for a tumble-home of 6 inches.

(*b*) **Steel Lower Decks. Clause 4** (*a*).

In the "Interpretations of the Rules, No. 1," page 4, Clause 3 (*c*), it is provided that the minimum thickness for unsheathed steel lower decks not required by the Rules and supported by beams at alternate frames is to extend fore and aft. The thickness at the extreme ends need not, however, exceed ·34 inch, as required for unsheathed steel decks on forecastles, short bridges and poops ("Interpretation of the Rules, No. 1," page 5).

(*a*) **Minimum Thickness of Steel Decks on Forecastles, Short Bridges and Poops. "Interpretation of the Rules, No. 1," Clause 3** (*h*).

The minimum requirements for *sheathed* steel decks quoted above only apply to vessels where the thickness of stringers and tieplates required by the Rules is ·30 inches and above. For smaller vessels the minimum thickness for steel decks which are sheathed need not exceed the thickness given by Table 25 for stringers and tieplates.

(*e*) **Continuity of Strength. Clause 5** (*b*).

For decks below the weather deck, instead of doubling plates, long overlaps of the deck plating may be fitted at the corners of the hatchways, provided the bulb angle coaming be smithed round the corner of the hatchway as an alternative to the large double-riveted bar specified in this Clause.

(*f*) **Caulking of Steel Decks. Clause 1** (*i*).

The requirement in this paragraph applies to steel decks, whether required by the Rules or not.

(*g*) **Stringer Plates. Clause 2.**

Where at the ends of a deck the stringer plate is dispensed with and the strakes of deck plating extend to the side of the vessel, the end thicknesses of each strake are to be the same as would have been required if the stringer plate had been fitted.

(*h*) **Table 24.**

In this Table the figures which give the upper limit of thickness in each grade may for purposes of interpolation be read as if increased by ·01 inch. Thus ·36 becomes ·37, ·50 becomes ·51 inch, and so forth.

SECTION 14. INCREASED FRAME SPACING.

(*a*) **Riveting. Clause 9.**

The spacing of rivets for various increases of frame spacing is to be in accordance with the following Table :—

	Spacing.	
	30 inches	36 inches
	Diams.	Diams.
Side Frames to Shell	6	$5\frac{1}{2}$
Side Frames to Reversed Frames	6	$5\frac{1}{2}$
Double Bottom Frames to Shell, except forward of 3-5 length	7	6
Double Bottom Frames to Floors, except forward of 3-5 length	7	7
Double Bottom Reversed Frames to Inner Bottom ...	7	6
Double Bottom Reversed Frames to Floors	7	7
Upper Deck Beams on every Frame	7	6
Second Deck Beams on every Frame	7	6
Bridge Deck Beams on every Frame	7	6
Poop Deck Beams on every Frame	7	7
Beams on alternate Frames	6	—

For increased spacings between 30 inches and 36 inches the riveting should be as required for 30 inches spacing, and for increased spacings below 30 inches the riveting should be as required by Table 38.

(*b*) **Thickness of Bridge Side Plating. Clause 4.**

By "Interpretations of the Rules, No. 1," the thickness of the bridge side plating is to be increased for frame spacing by the same amount as the shell plating. This increase has been found to be unnecessary, and is now cancelled.

SECTION 15. BEAMS.

(*a*) **Scantlings. Clause 1 (*c*).**

When the height of 'tween decks adopted is less than 8 feet, the scantlings of beams may be reduced in the ratio of the height of 'tween decks to 8 feet.

(*b*) **Beam Knees. Clause 3.**

The depth of beam knee is required to be three times the depth of the beam which is given in the Tables in terms of breadth of deck and spacing of beams for a 'tween deck height of 8 feet 6 inches.

Where the size of beams has been modified either for an alteration of frame spacing or of 'tween deck height, or to suit special conditions of loading or support, the depth of beam knee as determined above is to be modified directly as the alteration of frame spacing or of 'tween deck height and proportionately as regards other conditions.

Where the size of the beam is determined by unequal spacing of support, the depth of the knee should be based on the length of span adjacent to the side of the vessel.

Where beams are increased in scantlings solely on account of the omission of a steel deck Clause 1 (*i*), the depth of the beam knee need not be increased.

(*c*) **Breadth of Lap of Beam Knee on Beam. Clause 3 (*h*).**

This Clause requires the breadth of the beam knees to be sufficient to take the specified number of rivets arranged in the single row, and spaced not closer than four diameters apart. To facilitate application, a column giving these breadths as measured from the end of the beam has been added to the Table given in the Rules, which, as amended, reads as follows:—

Depth of Knee.	Number of Rivets.	Diameter of Rivets.	Length of Overlap of Beam Knee on Beam. Single Row of Rivets.
17 inches	4	$\frac{3}{4}$ of an inch	12 inches
21 ,,	5	$\frac{3}{4}$,, ,,	15 ,,
24 ,,	5	$\frac{7}{8}$,, ,,	17 ,,
28 ,,	6	$\frac{7}{8}$,, ,,	21 ,,
32 ,,	7	$\frac{7}{8}$,, ,,	24 ,,
36 ,,	8	$\frac{7}{8}$,, ,,	27 ,,
40 ,,	9	$\frac{7}{8}$,, ,,	31 ,,
44 ,,	10	$\frac{7}{8}$,, ,,	35 ,,

(*a*) **Beam Knees in Single-decked Vessels. Clause 3 (*d*).**

(1) The dimensions of the beam knees given in the Table in this Clause are intended to apply where the frame spacing given in the Rules is adopted.

Where variations of this frame spacing are proposed, the dimensions of the knees are to be increased or reduced in accordance with the altered frame spacing. All knees 36 inches and above in depth are to be flanged on their inner edge.

(2) The increased size of beam knee required by this Clause is to be maintained throughout, except under long bridges, where ordinary knees may be fitted except for four frame spaces at each end of the bridge.

(*e*) **Beams Below Bulkheads.**

Beams are not required under complete end bulkheads of detached superstructures, nor below a 'tween deck bulkhead. Where beams are thus omitted, the side frame above or below the bulkhead is to have a bracket attachment at its end or is to be scarphed.

SECTION 16. PILLARS AND GIRDERS.

(*a*) **Brackets to Girders at Heads of Tubular Pillars. Clauses 3 (*c*).**

Where non-symmetrical types of girders are associated with tubular pillars, it is necessary to provide adequate arrangements at the heads of the pillars for the effective transmission of the loads. In such cases a longitudinal bracket is to be fitted two frame spaces in length, which is to be connected to the girder itself by a transverse diaphragm fitted over the axis of the pillar.

(*b*) **Brackets to Deck Girders. Clause 4 (*c*).**

Deck Girders having single bulb angles on the lower edge are required by the Rules to be fitted with plate brackets not more than three frame spaces apart.

Where beams are fitted at alternate frames these brackets are to be fitted at every beam.

SECTION 17. WATERTIGHT BULKHEADS.

Chain Lockers.

Where chain lockers are fitted abaft the fore peak bulkhead, they are to be made watertight.

SECTION 18. SHAFT TUNNELS.

Stiffeners. Clause 2 (*a*).

Where the spacing of tunnel stiffeners is greater than 36 inches, the thickness of the tunnel plating is to be increased at the rate of ·04 inch for 6 inches increase of spacing.

SECTION 19. DEEP TANKS AND PEAK TANKS.

Deck Plating Forming Crown of Deep Tanks. Clause 3 (*b*).

The addition specified in this Clause need not be required for plating which forms the crowns of peak tanks, provided cargo is not carried above.

SECTION 20. OIL FUEL BUNKERS.

Middle Line Bulkheads and Washplates. Clause 5 (*b*).

Where the bulkhead is perforated, the stiffeners may have not less than 50 per cent. of the strength of those required by the Rules for the bulkhead if intact, due regard being paid to the unsupported length of the stiffeners.

SECTION 21. STIFFENERS TO NON-WATERTIGHT BULKHEADS.

Middle Line Bulkheads. Clause 1 (*b*).

(1) Where the frame spacing has been increased beyond the requirements of the Rules, the Modulus (I/Y) of the stiffeners and plating is to be proportionately increased, but the thickness of the bulkhead plating need not be increased.

(2) Where a middle line bulkhead is fitted below poops, bridges or forecastles *not intended for the carriage of cargo*, the scantlings of the stiffeners do not require to be increased.

SECTION 22. DETACHED SUPER-STRUCTURES.

Strengthening at ends of Poops, Forecastles and Bridges. Clause 4.

In this Clause the provision made for scarphing the heavy material fitted in the wells into the structure of long bridges is to apply not only to the deck plating, but to all topside material, including the sheerstrake and the strake below.

SECTION 30. RIVETING.

Weather Deck Stringer Angles.

The rivets in stringer angle bars of weather decks are to be spaced in accordance with the following Table :—

Size of Flanges.	Spacing of Rivets.
Inches.	Diameters.
3 × 3	$4\frac{1}{2}$
$3\frac{1}{2}$ × $3\frac{1}{2}$	$4\frac{1}{2}$
5 × 5	2 rows 6 in each row
6 × 6	2 „ 5 „ „
7 × 7	2 „ 5 „ „
8 × 8	2 „ $4\frac{1}{2}$ „ „

(*b*) **Lower Edge of Sheerstrake. Table 39.**

The riveting of the lower edge of the sheerstrake may be the same as required for the side plating.

(*c*) **Breadths of Flanges of Bars. Clause 9.**

This Clause provides that the breadths of flanges of connecting angles are to be a certain multiple of the rivet diameter. In addition, Section 15, 1 (*j*) permits the breadth of the deck flange of the beam to be proportional to the rivet diameter. These requirements show that the breadths of *connecting flanges* of sectional material can also be accepted as multiples of the rivet diameter, in accordance with Section 30, Clause 9.

SECTION 33. STEERING GEARS.

Scantlings of Quadrants. Clause 2 (*a*).

Where a loose quadrant is fitted, the depth of the boss may be reduced 10 per cent.

SECTION 35. VESSELS CARRYING AND BURNING OIL FUEL.

(*a*) **Riveting of Margin Bar. Clause 6.**

Where a tank top is carried level to the ship's side, the margin angles are to be double riveted.

(*b*) **Spacing of Rivets in Double Bottom. Clause 6.**

The spacing of the rivets in the butts and seams of inner bottom plating need not be closer than 4 diameters. The spacing of the rivets connecting frames to shell plating and floors, and those connecting reversed frames to inner bottom and floors, may be 7 diameters, if the rule frame spacing is not exceeded.

SECTION 37. MASTS, SPARS AND RIGGING.

Masts Carrying Derricks. Clause 6 (*b*).

This Clause states that the scantlings of masts of steamers are considered to be suitable for the support of an average equipment of derricks of normal outreach.

Where proposals are submitted for approval which embody a departure from average conditions, either in respect of the amount of the load to be lifted or of the outreach of the derricks, the figures representing the abnormal loads or dimensions are to be deleted from the plan, and a notification made that the responsibility for the design of a mast or derrick suitable to the conditions proposed must rest between the Owners and Builders.

For the purpose of this note it may be taken that an average equipment of derricks is capable of lifting a load of 5 tons.

SECTION 41. GENERAL.

Butt Straps to Continuous Longitudinal Angles. Clause 4.

The angles connecting the centre girder to the keel plate and to the inner bottom plating need not be strapped at the butts.

GENERAL.

LENGTHS OF ERECTIONS.

Tables 2, 3, 4, 20, 21, 22 and 53.

The lengths of super-structures to be used in determining the scantlings of the frames and the thickness of the strength deck in full scantling vessels are the overall lengths at the side, whether a super-structure is recessed at the centre or not.

LLOYD'S REGISTER OF SHIPPING.

NOTICE.

With reference to Notice No. 1420, intimating that it was not considered desirable to make the application of the Revised Rules compulsory until the Regulations consequent on the Report of the Load Line Committee of 1916 had been issued by the Board of Trade, NOTICE IS HEREBY GIVEN that the General Committee, at a Special Meeting held this day, have decided to further postpone the compulsory application of the Rules until a later date.

The Revised Rules may be adopted in the cases of any vessels which may be contracted for in the meantime.

By order of the Committee,

ANDREW SCOTT,
Secretary.

71, Fenchurch Street, London, E.C.3.
19*th June*, 1924.

STEEL TRAWLERS.

THE SOCIETY'S REVISED RULES AND REGULATIONS FOR THE CONSTRUCTION AND CLASSIFICATION OF STEEL TRAWLERS ARE PUBLISHED IN A SEPARATE VOLUME AND MAY BE OBTAINED ON APPLICATION. PRICE :—7s. 6d.

RULES FOR REFRIGERATING MACHINERY AND APPLIANCES OF REFRIGERATED RAILWAY CARS.

The Committee have approved and adopted Rules for the Survey of Refrigerating Machinery and Appliances of Refrigerated Railway Cars which may be had on application.

CHANGES IN PRESENT EDITION OF THE RULES.

Additions and amendments which have been adopted by the Committee since the issue of the previous (1929–30) edition of the Rules, will be found in the following Sections :—

RULES AND REGULATIONS.

Page 1, Section 7. Page 2, Section 9, par. 3. Page 3, Section 17, par. 6. Page 6, Section 29.

GENERAL REGULATIONS.

Page 14, Special Survey No. 1, par. 14.
Page 16, Special Survey No. 2, par. 17.
Page 18, Special Survey No. 3, par. 17.
Page 20, par. 4.
Page 21, "Internal Combustion Engines and their Auxiliaries" has been amended to "Petrol, Paraffin, and Heavy Oil Engines and their Auxiliaries," and a new par. (*d*) added.
Page 22, Examination of Electric Fittings.
Page 23, clause 5.
Page 23, clause 2. Machinery.

STEEL VESSELS.

Page 26, Section 4, clause 5 (*a*), 5 (*b*) and 7 (*c*)

Page 56, Section 25, clause 6.

Page 69, Section 40, clause 9, sub-pars. 2, 3 and 4.

MACHINERY.

Page 89, Section 4, clause 7.

Page 107, "Rules for Internal Combustion Engines" now read "Rules for Petrol and Paraffin Engines."

Page 113, "Rules for Diesel Engines and their Auxiliaries" now read "Rules for Heavy Oil Engines and their Auxiliaries" and have been amended.

RULES FOR ELECTRIC FITTINGS.

Page 119, Section 2.

Page 120, Section 3, clause 2.

Page 122, C. Three Phase System, par. (*a*).

Page 122, clause 5.

Page 123, clause 5, par. (*g*).

Page 123, clause 5, new par. (*j*).

Page 123, clause 6, par. (*b*).

Page 123, clause 7, par. (*a*).

Page 123, Section 4, clause 2.

Page 124, Section 4, clause 4.

Page 124, Section 4, clause 5.

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Page 124, Section 5, clause 2.

Page 124, Section 5, clause 3.

Page 124, Section 5, clause 4.

Page 125, Section 5, clause 5.

Page 125, Section 6, clause 1.

Page 125, Section 6, clause 2.

Page 125, Section 6, clause 3, par. (*c*).

Page 126, Section 6, clause 3, par. (*d*).

Page 126, Section 6, par. (*f*).

Page 126, Section 6. A new par. (*h*) has been added.

Page 126, Section 7, clause 1.

Page 127, Section 7, clause 4.

Page 128, Section 7, clause 9, par. (*c*).

Page 128, Section 7, clause 9, par. (*d*).

Page 128, Section 8, clause 4.

Page 128, Section 9, clause 1, par. (*a*).

Page 129, Section 9, clause 1 (*b*). A new par. (*c*) has been added, and par. (*d*) relettered (*e*) and amended.

Page 129, Section 9, clause 3.

Page 129, Section 9, clause 5, par. (*b*).

Page 129, Section 10, clause 5, par. (*a*).

Page 130, Section 11, clause 1, pars. (*a*) and (*b*).

Page 130, Section 11, clause 3, par. (*a*).

Page 130, Section 12. The heading "Miscellaneous" has been deleted and "Internal Combustion" inserted and the Section re-written.

Page 130, Section 12. Clause 2 of this original Section has been re-numbered to form Section 13.

Page 130, Section 13 has been re-numbered 14 and amended.

Page 131, Section 14 has been re-numbered 15. Two new Sections 16 and 17 have been added.

Page 131, Section 15 has been re-numbered 18.

Page 132, Tables I. to V. (inclusive) and VI. and VII. have been amended, and five new tables have been added.

RULES FOR REFRIGERATING MACHINERY AND THEIR APPLIANCES.

Page 137, Section 1, clause 1.

RULES FOR QUALITY AND TESTING OF MATERIALS.

Page 155, Section 14. This Section has been re-written.

Page 156, Section 15 has been deleted and embodied in Section 14

TABLES OF SCANTLINGS AND EQUIPMENT.

Tables 53 and 54 have been amended.

LLOYD'S REGISTER OF SHIPPING.

FOUNDED 1760. RE-CONSTITUTED 1834.

UNITED WITH THE

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RULES & REGULATIONS

FOR THE

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1*st July*, 1930.

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1930–1931.

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SECRETARY.
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Office, 201, *Tower Building*, *Liverpool.*
1*st July*, 1930.

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1930–1931.

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Office, 342, *Argyle Street*, *Glasgow*, *C.2.*
1*st July*, 1930.

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From the Imperial Airways, Ltd.

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From the National Flying Services, Ltd.

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Surveyor for Aircraft:
L. J. Hill, Esq.

LLOYD'S REGISTER OF SHIPPING.

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1930–1931.

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* Comendádor con Placa de la Real Orden de Isabel La Católica.

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J. J. TYNAN, Esq., *Vice-President*, Bethlehem Steel Company, and *Vice-President*, Bethlehem Shipbuilding Corporation, Ld., San Francisco.
S. W. WAKEMAN, Esq., *Vice-President*, Bethlehem Shipbuilding Corporation, Ld., Quincy, Mass.

† Chevalier de la Légion d'Honneur.

CHIEF SURVEYOR FOR THE UNITED STATES AND CANADA.

JAMES FRENCH, Esq.

Office: 17, *Battery Place, New York.*
1*st July*, 1930.

LLOYD'S REGISTER OF SHIPPING.

COMITÉ FRANÇAIS, 1930-1931.

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MM. F.GODARD, O.✲ et L. GAUMONT, *Vice-Présidents.*

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Expert près du Tribunal de la Seine,
Vice-Président de la Compagnie Navale et Commerciale de l'Océanie,
Administrateur-Directeur de la Foncière (Transports),
Administrateur-Délégué de la Société pour le Commerce entre la France et les Pays d'Outre-Mer (Anciennement Fould & Cie.),
Administrateur de la Société Générale de Transports Maritimes à Vapeur, de la Société de Construction Mécanique Procédés Sulzer, et de la Société des Entrepôts Frigorifiques et Docks de la Gironde.

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Maître de Forges,
Membre de la Commission de Direction du Comité des Forges de France,
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Président de la Compagnie Africaine d'Armement,
Président de la Société Anonyme de Navigation "Les Armateurs Français,"
Président de l'Union Française Maritime.
Président du Comptoir Maritime (Cies Françaises d'Assurances Maritimes),
(*Vice-Président du Comité Central des Armateurs de France*).

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Ingénieur de la Marine,
Administrateur des Chantiers Navals Français.

PAUL CYPRIEN FABRE, O.✲
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Administrateur de la Compagnie de Navigation Sud-Atlantique,
(*Vice-Président du Comité Central des Armateurs de France*).

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Administrateur-délégué Directeur de l'Union-Maritime (Cie d'Assurances Maritimes).

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(*Vice-Président du Comité Central des Armateurs de France*),
(*Vice-Président du Syndicat Marseillais de la Marine Marchande*).

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Armateur, E. Grosos & Fils.

PAUL HOUËT,✲
Capitaine au long cours,
Secrétaire technique honoraire du Comité Central des Armateurs de France,
Ancien expert maritime près le Tribunal Civil de la Seine,
Administrateur de l'Association Petrolière, de la Société Générale des Huiles de Pétrole, de la Société des Ateliers de Réparations Maritimes Beliard Crighton & Co., et de la Société d'Exploitation des Dispositifs de Mâts de Charge Brévetés Système R. Puissesseau.

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Administrateur Délégué de la Société Nationale d'Affrêtements.

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Président du Conseil d'Administration des Chargeurs de l'Ouest, de la Compagnie Navale Industrielle, et de la Société des Vapeurs Nantais,
Administrateur de la Compagnie des Chemins de Fer d'Orléans, de la Société Générale de Touage & de Remorquage, et de la Société Maritime Nationale,
Président du Syndicat des Armateurs de l'Ouest,
(*Président honoraire du Comité Central des Armateurs de France*).

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Président de la Société de Navigation à Vapeur France-Indo-Chine,
Président des Sociétés Provençales de Constructions Navales et Aéronautiques,
Président de la Société Franco-Chinoise de Constructions Métalliques et Mécaniques Kiou-Sin,
Vice-Président de la Compagnie Marseillaise de Navigation à Vapeur (Cie. Fraissinet),
Vice-Président de la Société de Navigation "Les Armateurs Français,"
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(*Président du Comité Central des Armateurs de France*).

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Directeur général honoraire de La Foncière, Compagnies d'Assurances contre les risques de transports et les accidents de toute nature.

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INGÉNIEUR-CONSEIL :

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Bureaux, 4, *Rue Auber, Paris.*
1*st July,* 1930.

O.✲ Officier de la Légion d'Honneur. ✲ Chevalier de la Légion d'Honneur.

LLOYD'S REGISTER OF SHIPPING.

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1930–1931.

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CAPTAIN ERIK W. SUNDBLAD, Aktiebolaget Lindholmen-Motala, Motala Verkstad.

PRINCIPAL SURVEYOR FOR SWEDEN:

V. C. BÜLOW, Esq.

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1*st July*, 1930.

LLOYD'S REGISTER OF SHIPPING.

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J. H. Wilton, Esq., Wilton's Engineering & Slipway Co., Rotterdam.

PRINCIPAL SURVEYOR FOR HOLLAND:

R. Leeuwenburg, Esq.

Office: *Willemskade*, 11B, *Rotterdam.*

1*st July*, 1930.

LLOYD'S REGISTER OF SHIPPING.

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H. OHTA, Esq., Osaka Shosen Kaisha.
N. OHTANI, Esq., Nippon Yusen Kaisha.
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TECHNICAL ADVISER TO THE JAPAN COMMITTEE:
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PRINCIPAL SURVEYOR FOR JAPAN:
H. JASPER COX, Esq.

Office: 32, *Akashi Machi* (*Meikai Building*), *Kobe.*
1*st July*, 1930.

LLOYD'S REGISTER OF SHIPPING

AND THE

REGISTRO ITALIANO NAVALE ED AERONAUTICO.

NOTICE.

In pursuance of the wishes of the Italian Government, an amalgamation was effected between the two Italian Classification Institutions, previously known as the Registro Navale Italiano, with headquarters at Genoa, and the Veritas Adriatico, with headquarters at Trieste, in order to establish one Italian register of shipping, under the name of the Registro Italiano, now known as Registro Italiano Navale ed Aeronautico.

An Agreement, which came into operation on the 1st April, 1922, was arrived at between the Registro Italiano and Lloyd's Register, with the object of facilitating the classification of vessels with both Societies in the interests of shipowners, shipbuilders and underwriters.

Under the terms of this Agreement, Italian shipowners, while securing the national classification for their vessels, are, at the same time, in a position to have Lloyd's Register class with as little inconvenience and expense as possible.

With this object, the Agreement provides that each Institution will give every facility for the assignment of its classification to vessels classed, or intended to be classed, by the other Society, provided the standard of strength and security is not inferior to that required by its own Rules, each Institution reserving to itself the right of confirming the class by means of surveys by its own Surveyors.

In order to obviate delays and inconvenience to shipowners and shipbuilders, the surveys of the two Societies will, as far as possible, be held simultaneously, and the Surveyors of both Registers are required to co-operate in entire harmony, and to hold jointly the surveys which they have to carry out.

REGISTRO ITALIANO NAVALE ED AERONAUTICO.

Registered Office & President's Office: ROME. Management Office: GENOA.

CONSIGLIO DI AMMINISTRAZIONE:

Presidente:

Ammiraglio di Squadra Riserva Navale On. Giovanni Sechi, Senatore del Regno.

Vice Presidenti:

Gr. Uff. Edgardo Morpurgo.
Gr. Uff. Michele Fileti.

Membri di diritto:

On. Ammiraglio Giovanni Sechi (*predetto*), Presidente del Comitato Direttivo.

Generale Ispettore RR. Capitanerie di Porto Cav. di Gr. Cr. Giulio Ingianni, Direttore Generale della Marina Mercantile (Ministero delle Comunicazioni).

Comm. Dott. Manlio Molfese, Capo dell'Ufficio Aviazione Civile e Traffico Aereo (Ministero dell'Aeronautica).

Gr. Uff. Dott. Antonio Crispo, Ispettore Generale delle Ferrovie, Tramvie ed Automobili presso il Ministero delle Comunicazioni.

Comm. Ing. Nav. e Mecc. Alberto Quojani, Consulente Tecnico del Comitato Direttivo.

Professore R. Università Pavia, Gr. Uff. Camillo Supino, Consulente Economico del Comitato Direttivo.

Dott. Bruno De Mori, Direttore Generale Unione Italiana di Riassicurazione.

(1).....(in rappresentanza del Ministero delle Colonie per gli affari concernenti le stesse).

Membri nominati da S.E. il Ministro delle Comunicazioni:

Gr. Uff. Ing. Giorgio Pruneri, Generale Ispettore del Genio Navale nella Riserva.

On. Dott. Comm. Ferruccio Lantini, Deputato al Parlamento, Esperto in materia commerciale.

Gr. Uff. Ing. Michele Fileti (*predetto*), Esperto in materia di Navigazione Marittima.

Ing. Nav. e Mecc. Cav. Ezio Moriondo, Professore stabile di macchine termiche presso la R. Scuola di Ingegneria Navale di Genova.

Ing. Nav. e Mecc. Cav. Mario Gleijeses, Professore stabile di Architettura Navale presso la R. Scuola di Ingegneria di Napoli, Sezione Navale.

Comm. Ing. Enrico Mellini, Esperto in materia di navigazione interna.

(1) Nomina in corso.

REGISTRO ITALIANO NAVALE ED AERONAUTICO.

CONSIGLIO DI AMMINISTRAZIONE (*continued*).

Membri nominati da S.E. il Ministro dell' Aeronautica:

Gr. Uff. Ing. G. Arturo Crocco, Tenente Generale del Genio Aeronautico, Professore di Teoria e Costruzione dei dirigibili nella Scuola di Ingegneria Aeronautica presso la R. Scuola di Ingegneria di Roma.

Comm. Giulio Costanzi, Maggior Generale del Genio Aeronautico.

Comm. Avv. Antonio Ambrosini, Professore di Diritto Aeronautico nella Scuola Superiore Aeronautica presso la R. Scuola di Ingegneria di Roma.

Membro nominato da S.E. il Ministro delle Colonie:

Tenente Colonnello di Porto Cav. Fabrizio Santasilia, Reggente l'Ufficio della Marina Mercantile presso la Direzione Generale Affari per l'Africa Orientale del Ministero delle Colonie.

Membri in rappresentanza degli Enti sotto indicati:

Federazioni Fasciste degli Armatori:

Cav. di Gr. Cr. Prof. Domenico Brunelli, Presidente della Federazione Fascista Armatori di linea del Tirreno.

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MALMÖ, *with a district extending from Malmö to Carlskrona, inclusive* — *Ship and Engineer Surveyor* (Office, Skeppsbron 3, Malmö) — O. A. Sunden (TELEGRAMS, *Register*; TELEPHONE No. 1871)

STOCKHOLM, *with a district including Gefle and Norrköping, with intermediate ports, and also Wisby* ... ... — *Ship and Engineer Surveyor* (Address, Bredgränd 2, Stockholm) — *Albert Isakson, K.N.O., K.V.O. (TELEGRAMS, *Lloyds Register*; TELEPHONE, *Rikstelefon*, 4161 & Sö 942)

FINLAND.

HELSINGFORS — *Ship and Engineer Surveyor* (Address, Sjöfartsstyrelsen) — *Ossian Tybeck (TELEGRAMS, *Surveyor*)

Ship and Engineer Surveyor (Address, Petersgaten 2) — *K. E. Eklund

DENMARK.

COPENHAGEN ... ... — *Ship and Engineer Surveyors* — A. F. Örbech; C. H. Kruhöffer; L. F. Klausen; K. L. Jensen

Ship Surveyors ... ... — J. R. Macleod, M.C.; J. G. Buchanan; S. Sandersen; W. D. Lydersen, B.Sc.

CONSULTANT... H. J. SONNE, R.D. (Office, Skt. Annae Plads 28[1], Copenhagen, K.) (TELEGRAMS, *Engineer* TELEPHONE No. 5760)

DANZIG.

DANZIG — *Ship Surveyor* ... ... (Office, 9, Elizabethwall) — J. C. Dykes

GERMANY.

HAMBURG, *with the River Elbe, Lübeck, Rostock, and ports in Schleswig-Holstein and Mecklenburg* ... ... — *Ship Surveyors* ... ... — A. Chisholm, B.Sc. *Principal Surveyor for Germany*; C. H. F. Priess; T. C. C. Goering; F. H. Ohlzen

Ship and Engineer Surveyors (Office, Steinhoeft 3, Hamburg) — M. Koch; F. C. M. Witt; A. H. A. Carstensen; P. A. Krützfeldt (TELEGRAMS, *Lloyd's Register, Steinhoeft, Hamburg*; TELEPHONE, *C6 Nikolas* 4235)

AUGSBURG — *Ship and Engineer Surveyor* (Residence, Horbrotstrasse, 6, Augsburg) (See also under Bremen) — V. F. J. Sdrowok (TELEGRAMS, *Sdrowok, Horbrotstrasse*, 6; TELEPHONE No. 1801)

BREMEN, *with Bremerhaven, Emden and surrounding ports* ... ... — *Ship and Engineer Surveyor* — G. H. C. Bahr

Ship Surveyor ... ... (Office, Feldstrasse 36, Bremen) — W. Meyer (TELEGRAMS, *Bahr, Feldstrasse* 36; TELEPHONE, *Hansa* 759.)

Ship and Engineer Surveyor (Resident at Augsburg) — V. F. J. Sdrowok

DÜSSELDORF — *Ship and Engineer Surveyors for Steel-testing duties and Inspection of Forgings, etc., in Germany* — K. Hauss; M. Berg; J. Quast; F. Schnell

Surveyors for Steel-testing duties (Office, Engerstrasse 13, Düsseldorf) — J. Loogen; M. Kellner; F. W. Kohlsaat (TELEGRAMS, *Lloyds Surveyors, Engerstrasse*; TELEPHONE No. 60313)

ELBING — *Ship Surveyor*... ... ... (Resident at Danzig) — J. C. Dykes

KÖNIGSBERG — *Ship Surveyor*... ... ... (Resident at Danzig) — J. C. Dykes

STETTIN, *with Swinemünde, Stralsund and neighbouring ports; also Berlin and vicinity* ... ... — *Ship and Engineer Surveyor* (Office, Bollwerk 4/5) — N. A. Stolte

HOLLAND.

AMSTERDAM, *including Leiden and inclusive of all ports north of the rivers Rhine and Lek* ... — *Ship and Engineer Surveyors* — F. N. Bernoski; H. P. Burgdorffer

Ship Surveyor ... ... (Office, Prins Hendrikkade 86, Amsterdam) — M. P. Jonker (TELEGRAMS, *Lloyd's Register*; TELEPHONE No. 43895)

ROTTERDAM, *with Zeeland, and including rivers Rhine, Lek, Holland Isel, and also south of these rivers* ... ... — *Ship Surveyors* ... ... — R. Leeuwenburg *Principal Surveyor for Holland*; L. Vuijk; J. van Herwerden; C. Lodder; L. H. Wehrmeijer; P. H. van der Weel

Ship and Engineer Surveyors (Office, Willemskade 11b, Rotterdam; Post Box 701) — J. J. Schoo; A. Bijlo; C. H. Bource; K. Kuijt (TELEGRAMS, *Lloyd's Register*, TELEPHONE NOS. 50615 & 52209)

SURVEYORS AT OTHER PORTS ABROAD—*continued.*

BELGIUM.

ANTWERP, *including all places in Belgium and the Dutch port Terneuzen ... ...* — G. O. Herbert, *Principal Surveyor*; W. E. Wray; A. G. Letac, *Ship Surveyors ... ...*

Ship and Engineer Surveyors (Office, Mersey House, Quai de Rouen 1, Antwerp) — C. H. L. Pilditch, O.B.E.; F. L. Rabaey; J. Thomson (TELEGRAMS, *Register*; TELEPHONE NO. 209.40)

Surveyors for Steel-testing duties ... ... — Arnold Bennett; M. A. Black; D. C. Butler

FRANCE.

PARIS — *Ingénieur-Conseil ... ...* (Office, 4 Rue Auber) — *E. L. M. Poincet (TELEGRAMS, *Lloydreg* 96; TELEPHONE NO. *Louvre* 32-71)

BORDEAUX, *with a district including La Rochelle, Bayonne and intermediate ports ... ...* *Ship and Engineer Surveyor ... ...* (Office, 4, Rue Lafayette) — J. Milet (TELEGRAMS, *Register*; TELEPHONE NO. 49-13)

BOULOGNE-SUR-MER, *Ship and Engineer Surveyor ... ...* (Address, 14, rue de la Tour Notre Dame) — *A. Couture (TELEPHONE NO. 1080)

BREST — *Ship and Engineer Surveyor* (Address, 1, Rue Jean Macé) — *L. A. Gouaillard (TELEPHONE NO. 2.91)

CAEN, *with Cherbourg ... ...* *Ship Surveyor ... ...* (Office, 2, rue de la Masse) — V. M. Linklater (TELEGRAMS, *Lloydreg*; TELEPHONE NO. *Caen* 6.31)

DUNKIRK, *with Calais and Gravelines* *Ship and Engineer Surveyor* (Office, Place Alfred-Petyt, Dunkirk) — R. Rennie (TELEGRAMS, *Lloydreg*; TELEPHONE NO. 947)

HÂVRE, *with a district including Barfleur and Fécamp ... ...* *Ship Surveyor... ... ...* — J. L. Davies

Ship and Engineer Surveyor (Office, 61, rue Jules Siegfried, Hâvre) — L. Hamelin (TELEGRAMS, *Lloyd's Register*; TELEPHONE NO. 42.15)

MARSEILLES, *and all French ports on the Mediterranean ... ...* *Ship Surveyor ... ...* — J. W. Stuart

Ship and Engineer Surveyors (Office, 8, rue de la République) — O. J. Trechmann; J. Wormald, B.Sc. (TELEGRAMS, *Lloydreg*, TELEPHONE NO. *Colbert* 3093)

METZ, *with a district including Alsace and Lorraine ... ...* *Surveyor for Steel-testing duties ... ...* (Address, 21, Avenue Maréchal Foch) — *E. C. Aymard (TELEGRAMS, *Lloydreg*)

NANTES, *with all ports on the coast between Brest (not including that port) and Sables d'Olonnes* *Ship and Engineer Surveyor* (Office, 47, Quai de la Fosse, Nantes) — R. J. Easthope (TELEPHONE NO. 111-65)

ROUEN, *with a district including Dieppe* *Ship Surveyor... ... ...* (Office, 14, rue de Fontenelle, Rouen) — N. V. Kirkley (TELEGRAMS, *Kirkley*, 14, *rue Fontenelle*; TELEPHONE NO. 56.89).

FRANCE—*continued.*

ST. ETIENNE, *Creusot and district ... ...* *Surveyor for Steel-testing duties ... ...* (Address, 7, rue de Lodi) — *C. Périchon (TELEPHONE NO. 25-17)

SWITZERLAND.

WINTERTHUR — *Ship and Engineer Surveyors* (Office, 1, Anton Graffstrasse) — W. G. Vallis; W. J. Ferguson, M.Eng.

SPAIN AND PORTUGAL.

BARCELONA — *Ship and Engineer Surveyor* (Office, Paseo de Colon 11) — G. J. Thomas (TELEGRAMS, *Surveyors*, TELEPHONE 15502)

Sub-Office at Valencia ... *Ship Surveyor ... ...* (Office, Paseo Caro, 15, Grao-Valencia) — A. E. Scott (TELEGRAMS, *Surveyors, Grao-Valencia*; TELEPHONE NO. 31831)

BILBAO — *Ship Surveyors ... ...* — R. Crawford; F. de Beraza

Ship and Engineer Surveyors (Address, Calle de Ibañez de Bilbao No. 22; Apartado de Correos No. 286) — J. C. Kendall; G. T. B. Scullard (TELEGRAMS, *Register*; TELEPHONE NO. 16137)

SEVILLE, *with all ports in the South of Spain (including Cadiz and Huelva) ... ...* *Ship Surveyor ... ...* — R. Langlands

Ship and Engineer Surveyor (Address, Pastor y Landero, 10, Seville) — W. Morrison (TELEGRAMS, *Registro*)

VALENCIA (*see* BARCELONA)

LISBON, *with a district including Vigo, Ferrol and Corunna... ...* *Ship and Engineer Surveyor* (Address, 7, T. do Caes do Tojo) — H. Y. Bell (TELEGRAMS, *Register*)

GIBRALTAR.

GIBRALTAR — *Ship and Engineer Surveyor ... ...* (Address, Waterport) — *W. J. Matthews (TELEGRAMS, *Repsalve*)

ITALY.

ANCONA — *Acting Ship and Engineer Surveyor ... ...* (Address, Via Fazioli) — *G. Badia (TELEGRAMS, *Gustavo Badia, Ancona*)

FIUME — *Ship and Engineer Surveyor* (Address, Piazza Dante 1/111) — Z. A. Ozegovic (TELEGRAMS, *Register*; TELEPHONE NO. 867)

GENOA ... ... — N. G. Turnbull, *Principal Surveyor for Italy*

Ship and Engineer Surveyors ... ... — J. W. Leicester; G. C. Vaux, Jun.; A. T. Griffith; Ing. A. Grasselli; G. de C. Ballardie, M.Sc

Ship Surveyors ... ... — J. S. Ormiston, B.Sc.; R. S. Johnson, B.Sc.; Ing. I. Aureli; C. A. Townshend

Surveyor for Steel-testing duties ... ... (Office, Piazza Cavour, 35, Genoa, 11) — A. S. Mantelli (TELEGRAMS, *Surveyors*; AUTOMATIC TELEPHONE NO. 22.862)

LEGHORN — *with district from Spezia (not including that port) to Civita-Vecchia; and also including Terni* *Ship and Engineer Surveyor* (Office, Via Ricasoli 22, Leghorn) — *Antonio Gori (TELEGRAMS, *Antonio Gori, Leghorn*)

SURVEYORS AT OTHER PORTS ABROAD—*continued.*

ITALY—*continued.*

MESSINA (*see* NAPLES)		
NAPLES	*Ship and Engineer Surveyor* (Address, Via A. Depretis 31, Naples, 76)	N. Geniram (TELEGRAMS, *Surveyors*, AUTOMATIC TELEPHONE No. 20-926)
	Sub-Office at Messina for the ports of Messina, Syracuse and Catania ... Assistant Ship and Engineer Surveyor ... ... (Address, Pace, Messina)	*Guido Bottari (TELEGRAMS, *Bottari-Pace, Messina*, TELEPHONE No. 4-52.)
	Sub-Office at Palermo Assistant Ship and Engineer Surveyor ... ... (Address, Via Libertà 82, Palermo (14), Sicily)	*A. Todaro (TELEGRAMS, *Surveyors*, TELEPHONE No. 34-55)
PALERMO (*see* NAPLES)		
TRIESTE, *with Pola and the Coast North of Pola; also Venice ...*		N. G. Turnbull *Principal Surveyor for Italy*
	Ship and Engineer Surveyors	H. C. Forster L. Stupari Cav. M. Bonivento A. Coe
	Ship Surveyors ... ... (Office, Via Mazzini 9, Trieste, 111; Casella postale No. 2)	M. Costantini, B.Sc. W. M. Balfour, B.Sc. Ing. M. Micalich (TELEGRAMS, *Register*; TELEPHONE No. *Aut.* 44-20)

YUGOSLAVIA.

SPLIT	*Ship and Engineer Surveyor*	A. J. Brown
SUSAK	*Ship and Engineer Surveyor* (Address, Tomislavova Ulice 4/11, Susak)	Z. A. Ozegovic (TELEGRAMS, *Register*)

CZECHO-SLOVAKIA.

PRAGUE	*Ship and Engineer Surveyor for steel testing duties ...* (Office, Vodickova 41 II, Prague II.)	P. Kertscher (TELEGRAMS, *Surveyor*; TELEPHONE No. 27515)

AUSTRIA.

VIENNA	*Ship and Engineer Surveyors for Steel testing duties, etc., in Austria, Hungary, Poland, German Upper Silesia, Czecho Slovakia at and East of railway line Bohumin-Breclav, and also including Czecho Silesia ...*	Hans Kolbow H. L. Jung (TELEGRAMS, *Surveyor*; TELEPHONES, OFFICE, No. U. 40-4-79, PRIVATE, No. B20-216)
	Surveyors for Steel-testing duties ... ... (Office, Starhemberggasse No. 39[111], Kolschitzkyhof, Vienna IV/2)	J. S. Helyer H. K. Schneider

MALTA.

MALTA	*Ship and Engineer Surveyor* (Address, P.O. Box 83)	*L. J. Calcaterra (TELEGRAMS, *Seaworthy*)

GREECE.

PIRÆUS AND SYRA	*Ship and Engineer Surveyors* (Address, 61, Odos Notara, Piræus)	R. G. Knox, O.B.E. A. W. Oxford (TELEGRAMS, *Register*; TELEPHONE No. 195)

TURKEY.

ISTANBUL	*including the Bosphorus, Sea of Marmora, and the Dardanelles (Canakkale) Ship and Engineer Surveyor* (Address, Hovaghimian Han Nos. 27–28, 3rd Floor, Galata; Galata Posta Kutusu No. 187, Istanbul)	*M. McLaren (TELEGRAMS, *McLaren Lloyd's Register, Istanbul*)

ROUMANIA.

BRAILA	... ...	*J. Corbu (TELEGRAMS, *Jacor*)

CANADA.

CHIEF SURVEYOR FOR THE UNITED STATES AND CANADA ... ... (Office, 17, Battery Place, New York)		James French (TELEGRAMS, *Nymdible. New York*)
HALIFAX, N.S.	*Ship and Engineer Surveyor* (Office, 37, Furness Withy Building)	T. Moon (TELEGRAMS, *Lloyd, Halifax, N.S.*; TELEPHONE No. *Sackville* 906)
MONTREAL AND QUEBEC, *with a district including the River St. Lawrence ... ...*	*Ship and Engineer Surveyor* (Office, 208, Lake of the Woods Building, Montreal)	G. Allan (TELEGRAMS, *Register*; TELEPHONE No. *Main* 7017)
ST. JOHN, N.B.	*Ship and Engineer Surveyor*	*C. E. Dalton (TELEGRAMS, *Dalton*)
TORONTO, ONT., *with a district including Lake Ontario and Collingwood, Ont. ... ...*	*Ship and Engineer Surveyor* (Address, 1, Wellington Street, West, Toronto, 2)	*John Stephen (TELEPHONE No. *Elgin* 5072)
VANCOUVER, B.C.	*including Victoria, Vancouver Island, and all ports in British Columbia ... ... Ship and Engineer Surveyors* (Office, Marine Building, Vancouver, B.C.)	A. Scott S. F. Boomer (TELEGRAMS, *Registrar*; TELEPHONE No. *Seymour* 2022)

NEWFOUNDLAND.

ST. JOHNS	*Ship and Engineer Surveyor* (Office, Marine and Fisheries Department, Custom House)	D. M. Macfarlane (TELEGRAMS, *Surveyor*)

PANAMA CANAL ZONE.

BALBOA, *with a district including all ports in the Panama Canal Zone*	*Ship and Engineer Surveyor* (Office, 218, Pacific Terminal Building, Balboa; P.O. Box 304)	J. Short (TELEGRAMS, *Register, Balboa* TELEPHONE No. 1831)

DUTCH WEST INDIES.

CURAÇAO, *including Aruba ... ...*	*Ship and Engineer Surveyors* (Address, Handelskade, 2, Willemstad; P.O. Box 169)	A. Connon E. S. Whitham (TELEGRAMS, *Register*)

BRITISH WEST INDIES.

KINGSTON (JAMAICA)	*Ship and Engineer Surveyor* (Address, Royal Mail Building, Port Royal Street)	*A. A. McInnes (TELEGRAMS, *McInnes*)

CUBA.

HAVANA	*Ship and Engineer Surveyor* (Address, San Pedro 4 (Altos), Apartado 843)	*T. F. Holmes (TELEGRAMS, *Holmes, Eureka, Havana*)

SURVEYORS AT OTHER PORTS ABROAD—*continued.*

SOUTH AMERICA.

BAHIA BLANCA	*Ship and Engineer Surveyor* (Address, Puerto Galvan)	*D. C. Bruce (TELEGRAMS, *Bruce, Galvan*)
BUENOS AYRES AND ROSARIO ALSO MONTE VIDEO	*Ship and Engineer Surveyors* (Office, Calle 25 de Mayo 158, Buenos Ayres)	J. C. G. Williamson A. J. Matheson A. W. Eaglesome A. Daintith (TELEGRAMS, *Surveyors*; TELEPHONE No. *Avenida* 2364)
GEORGETOWN, DEMERARA	*Ship and Engineer Surveyor* (Address, 12, Water Street)	*A. G. Stirling
MAGALLANES, CHILI	*Ship and Engineer Surveyor* (Address, Calle Roca 973; Casilla, 145)	*J. Dickson (TELEGRAMS, *Dickson*)
RIO DE JANEIRO	*Ship and Engineer Surveyor* (Office, Rua São Pedro 9, 2nd floor; Caixa Postal 563)	*H. E. Inman (TELEGRAMS, *Surveyor, Rio de Janeiro*; TELEPHONE No. *Norte* 4762)
TALCAHUANO, CHILI,	*with a district extending from Talca in the north to Chiloe in the south* *Ship and Engineer Surveyor* (Address, Calle Colon 202; Casilla 245)	*J. E. Alfaro (TELEGRAMS, *Alfregister*)
VALPARAISO	*Ship and Engineer Surveyor* (Address, Casilla 1342)	*A. F. Smith (TELEGRAMS, *Smithlloyd, Valparaiso*)

NORTH AFRICA.

ALGIERS	*Ship and Engineer Surveyor* (Office, 29, Boulevard Carnot)	*Dewar Paton (TELEGRAMS, *Register*)

EGYPT AND RED SEA.

ADEN	*Ship and Engineer Surveyor* (Address, Hedjuff)	*G. H. Nunn (TELEGRAMS, *Lloydsur*)
ALEXANDRIA	*Ship and Engineer Surveyor* (Address, 5, Rue Bolanachi)	*H. Bishop (TELEGRAMS, *Register*; TELEPHONE NOS. 432 & 840 R)
PORT SAID	*Ship and Engineer Surveyor* (Address, P.O. Box 2)	*J. Macvey (TELEGRAMS, *Macvey*; TELEPHONE No. 546)

SOUTH AFRICA.

CAPE TOWN	*Ship and Engineer Surveyor* (Address, Thomson Watson's Buildings, Adderley Street)	*J. Wood (TELEGRAMS, *Lloydsreg*)
EAST LONDON	(Address, 38, Britannia Arcade)	*J. C. Morison (TELEGRAMS, *Register*)
PORT ELIZABETH	*Ship and Engineer Surveyor* (Address, Harbour Works)	*H. McG. Richardson (TELEGRAMS, *Richardson, Harbour, Port Elizabeth*)
PORT NATAL	*Ship and Engineer Surveyor* (Address, Rennie's Buildings, 394, Smith Street, Durban; P.O. Box 170)	A. H. Boyle, D.S.C. (TELEGRAMS, *Lloydsreg, Durban*; TELEPHONE No. 742)

MAURITIUS.

MAURITIUS	(residing at Port Louis)	*K. S. Macdonald (TELEGRAMS, *Macdonald, Port Louis, Mauritius*)

INDIA, CEYLON, BURMAH, SIAM, COCHIN-CHINA, AND STRAITS SETTLEMENTS.

BANGKOK	*Ship and Engineer Surveyor* (Office, Chartered Bank Lane)	*T. H. Pollard (TELEGRAMS, *Pollard*)
BOMBAY	*Ship and Engineer Surveyor* (Office, Exchange Building, Sprott Road, Ballard Estate)	H. P. Southwell (TELEGRAMS. *Surveyor*; TELEPHONE No. 3335)
CALCUTTA	*Ship and Engineer Surveyors* (Office, 29, Dalhousie Square)	B. Peskett E. Oxley (TELEGRAMS, *Freeboards*)
COLOMBO	*Ship and Engineer Surveyor* (Address, 16, Queen Street)	*H. S. Melton (TELEGRAMS, *Register*)
KARACHI	*Ship and Engineer Surveyor* (Address, Port Office, Bunder Road)	*W. A. Cable (TELEGRAMS, *Surveyor*)
PENANG	*Acting Ship and Engineer Surveyor* ... ... (Address, Office of the Surveyor of Ships)	*H. Smith
RANGOON	(Address, Lower Poozoondoung)	*R. P. Taylor (TELEGRAMS, *Orion*)
SAIGON	*Ship and Engineer Surveyor*	
SINGAPORE	*Ship and Engineer Surveyor* (Address, 2, Laidlaw Building, Battery Road)	J. T. Findlay (TELEGRAMS. *Surveyor*; TELEPHONE No. 65)

EAST INDIAN ARCHIPELAGO.

BATAVIA	... ... (Address, c/o De Vereenigde Prauwenveren, Factorystraat)	* L. Buiskool (TELEGRAMS, *Buiskool, Vereenigde Prauwenveren*)
MANILA, P.I.,	*and ports in the Philippine Islands* ... ... *Ship and Engineer Surveyor* (Address, 129, Dasmarinas, Binondo, Manila)	*C. B. Nelson (TELEGRAMS, *Register*)
SABANG	... ...	
SOURABAYA	*Ship and Engineer Surveyor* (Address, Roomsche Kerkstraat 12)	P. F. Willemse (TELEGRAMS, *Register*)

HONG KONG.

HONG KONG	*Ship and Engineer Surveyors* (Office, 5, Alexandra Buildings; P.O. Box 463)	T. S. Morrison G. Pickering (TELEGRAMS, *Marine*; TELEPHONE No. 179)

CHINA.

DAIREN, MANCHURIA	*Ship and Engineer Surveyor* (Address, 5, Higashikonzecho; P.O. Box 17)	J. Sim (TELEGRAMS, *Register*)
HANKOW	*Ship and Engineer Surveyor* (Address, 1, Racine Building, Rue Dubail, French Concession)	*C. W. Butson (TELEGRAMS, *Lloydsreg*)
SHANGHAI	*Ship and Engineer Surveyor* (Address, Glen Line Building, 2, Peking Road)	F. G. B. Smith (TELEGRAMS, *Register*)
TIENTSIN	*Ship and Engineer Surveyor* (Address, c/o Borrows & Co., Liddell's Buildings, Taku Road)	*A. J. Miller (TELEGRAMS, *Seaworthy*)

SURVEYORS AT OTHER PORTS ABROAD—*continued.*

JAPAN.

KOBÉ	*Ship Surveyors* ... ... (Office, 32, Akashi Machi (Meikai Building)	H. Jasper Cox *Principal Surveyor for Japan.* M. M. Parker, M.Sc. (TELEGRAMS, *Register*; TELEPHONE No. 2530 *Sannomiya*)
	Ship and Engineer Surveyors	H. A. Garnett H. D. Buchanan A. D. Morrison
	Assistant Surveyors ...	Y. Jo M. Kamakura
NAGASAKI	*Ship and Engineer Surveyor* *Assistant Surveyor* ... ... (Office, No. 9, Oura, Kaigan-Dori)	G. Anderson K. Kishigami (TELEGRAMS, *Register*)
YOKOHAMA	*Ship Surveyor* ... ... *Ship and Engineer Surveyor* *Assistant Surveyor* ... ... (Office, 11, Nihon Odori, Naka-ku; P.O. Box No. 48)	A. McGlashan J. F. Nicholas T. Kunishi (TELEGRAMS, *Register*)
HAKODATE	*Assistant Ship and Engineer Surveyor* ... ... (Address, No. 55, Benten-machi)	*Zenzo Sato

AUSTRALIA AND NEW ZEALAND.

SYDNEY, N.S.W.	*Ship and Engineer Surveyors* (Office, 4, Bridge Street; G.P.O. Box No. 338F)	A. C. Heron *Principal Surveyor for Australia and New Zealand* E. L. Cartwright J. C. Erskine B. P. Fielden (TELEGRAMS. *Miramar*; TELEPHONE, No. B.W.7023—*Automatic*)
ADELAIDE, S. A.	*Ship and Engineer Surveyor* (Address, Institute Chambers, Divett Street, Port Adelaide)	*W. D. Ackland-Horman (TELEGRAMS. *Dinwoodie*; TELEPHONE No. J 2301)

71, *Fenchurch Street, London, E.C.*3.
1*st July*, 1930.

AUSTRALIA AND NEW ZEALAND—*continued.*

AUCKLAND, N.Z.	(Office, 63, Endeans Buildings, Queen Street)	*W. Richard Smith (TELEGRAMS. *Somisto*; TELEPHONE No. 43-163)
BRISBANE, QUEENSLAND,	*Ship and Engineer Surveyor* (Office, Orient Line Building, Eagle Street; G.P.O, Box 1109N)	T. G. Tate (TELEGRAMS, *Register*; TELEPHONE No. B5631)
CHRISTCHURCH & LYTTELTON, N.Z.	*Ship and Engineer Surveyor* (Office, T. and G. Buildings, 192, Hereford Street, Christchurch)	*J. F. Taylor (TELEGRAMS. *Oileng*; TELEPHONE No. 35—088)
DUNEDIN, N.Z.	*Ship and Engineer Surveyor* (Address, 123, High Street)	*W. J. Crawford (TELEGRAMS, *Cellular*; TELEPHONE No. 10-672)
FREMANTLE, W.A.	(Address, Dalgety's Buildings, Cliff Street)	*R. E. Arundel (TELEGRAMS, *Arundel*)
LYTTELTON, N.Z. (*See* CHRISTCHURCH, N.Z.)		
MELBOURNE, VICTORIA	*Ship and Engineer Surveyors* (Office, New Zealand Chambers, 483, Collins Street)	*Alexander McCowan A. J. McCowan (TELEGRAMS, *Reports*; TELEPHONE No. 3386)
NEWCASTLE, N.S.W.	*Ship and Engineer Surveyor* (Office, Scottish House; P.O. Box 64)	*E. M. Hughes (TELEPHONE, No. 1189 *Newcastle*)
PORT PIRIE, S.A.,	*with Port Germein and Wallaroo* ... ... (Address, P.O. Box 65, Port Pirie)	*A. J. Elms
TIMARU, N.Z.	... ... (Address, Harbour Master, Timaru)	*Duncan McDougall
WELLINGTON, N.Z.	*Ship and Engineer Surveyor* (Address, Nathan's Buildings)	*D. K. Blair (TELEGRAMS, *Diesel*; TELEPHONE No. 43-624)

LLOYD'S REGISTER OF SHIPPING.

RULES AND REGULATIONS.

Section 1. This Society, founded in 1760 and reconstituted in 1834, was established for the purpose of obtaining for the use of Merchants, Ship Owners, and Underwriters, a faithful and accurate Classification of Mercantile Shipping, and for the government of which the following Rules and Regulations have been from time to time adopted.

Section 2. A Register Book to be printed annually for the use of Subscribers, containing the names of the Ships with other useful information, and the Character assigned, where the vessels are classed by the Society; also the names, &c., of all Ships of 100 tons and upwards unclassed by this Society.

Section 3. Each person subscribing the sum of Six Guineas per annum (or such other sum as the General Committee may fix) to be considered a Member of the Society, and entitled *for his own use* to one copy of the Register Book.

Section 4. The subscription of Marine Insurance Companies, Public Companies or Public Establishments, to be Twelve Guineas per annum, for a single copy of the Register Book, and Six Guineas per annum for every additional copy supplied, unless the copies be periodically posted with type with additions and corrections throughout the year, in which case the subscription for each copy supplied will be Twenty Guineas per annum.

Section 5. In the case of other Subscribers, the subscription to be Six Guineas per annum for each copy, unless periodically posted with type with additions and corrections throughout the year, in which case the subscription will be Ten Guineas per annum for each copy supplied.

Section 6. For the convenience of Subscribers not resident in London, or whose Register Books are not posted, a Supplement, containing the additions to, and corrections made in, the Register Book, to be printed fortnightly, in such convenient form as to admit of its transmission by Post, so that such parties may be furnished, from time to time, with the latest and most complete information.

Section 7. The superintendence of the affairs of the Society to be under the direction of a General Committee composed of Merchants, Ship Owners, and Underwriters (twenty-four elected in London and thirty-seven at the principal Outports), and the following, namely :—Shipbuilders and/or Engineers, not exceeding ten, who may be elected by the General Committee ; additional Members, not exceeding eight, who may be elected by the General Committee ; past Chairmen of the Society, who may be elected by the General Committee, and the following *ex-officio* members, namely :—The Chairman, or, in his absence, the Deputy-Chairman, of the Corporation of Lloyd's ; the Chairman, or, in his absence, the Deputy-Chairman, of the London General Shipowners' Society, and the Chairman of each Branch Committee established abroad.

Any member (except an *ex-officio* member, or a member elected by the General Committee) who fails to attend any meetings of the General Committee for a period of six consecutive months, without leave of absence, shall cease to be a member, and his place shall be filled up in the usual way.

Note.—Official intimation to be given in June of each year whether the Chairman or Deputy-Chairman of the Corporation of Lloyd's, and the Chairman or Deputy-Chairman of the London General Shipowners' Society, are to be the *ex-officio* members for the ensuing twelve months.

Section 8. The General Committee reserve the right of varying or withdrawing the representation of Outports, and of Shipbuilders and Engineers; also the representation of Shipbuilders, Engineers, Steel Makers, and Forgemasters on the Technical Sub-Committee hereinafter mentioned, as well as the mode of election of members.

Section 9. 1. Six of the Members elected in London, namely, two of each of the constituent parts of the Committee, to go out annually by rotation, but to be eligible to be re-elected. The vacancies so arising to be filled up by the election of two Underwriters and one Merchant by the Committee of Lloyd's, and two Shipowners and one Merchant by the Committee of the London General Shipowners' Society.

2. Of the Members elected at the Outports twenty-one to retire at the end of four years, and seven of the Members elected at Liverpool and the nine Members elected at Glasgow to retire annually. The retiring Members are eligible for re-election.

3. All Members elected by the General Committee are to retire at the end of four years, and are to be eligible for re-election.

Section 10. The Committee to appoint Sub-Committees of Classification, to be so regulated that each Member of the General Committee may, in rotation, take his turn of duty thereon throughout the year.

Section 11. The Committee to appoint from their own body, annually, a Chairman and Deputy-Chairman; and also a Chairman or Chairmen of the Sub-Committees of Classification.

Section 12. The Secretary, Clerks, and Servants of the Society, and the Surveyors, to be appointed by and be under the direction of the General Committee.

Section 13. Special meetings to be convened by order of the Chairman, or Deputy-Chairman or on the requisition of any three Members.

Section 14. All elections and appointments to be made by ballot, excepting when in the election of Chairman, Deputy-Chairman, or Chairman or Chairmen of the Sub-Committees of Classification, only one person is nominated for each office.

Section 15. No Member of the Committee to be permitted to be present on the decision of the classification of any ship of which he is the owner, or wherein he is directly, or indirectly interested.

Section 16. 1. The Committee to be empowered to make such Bye-laws for their own government and proceedings as they may deem requisite, not being inconsistent with the original Rules and Regulations under which the Society was established; but no new Rule or Bye-law to be introduced or any Rule or Bye-law altered, without special notice being given for that purpose at the Meeting of the Committee next preceding that at which such Motion is intended to be made; such notice to be inserted in the summons convening the meeting.

2. No new Rule, or alteration in any existing Rule materially affecting the classification of Ships, to be applied compulsorily to vessels of which the plans have been submitted and approved before the expiration of six months after the date when the change has been adopted.

Section 17. 1. That fifteen representatives of Shipbuilders, Engineers, Steel Makers, and Forgemasters shall be admitted as members of the Technical Sub-Committee on all occasions when it is proposed to make alterations in the existing rules, or to frame new rules, for the construction of ships or machinery.

2. That twelve representatives of Shipbuilders and Engineers shall be elected by the following bodies, viz. :

(*a*) The Institution of Naval Architects, London ;

(*b*) The North-East Coast Institution of Engineers and Shipbuilders, Newcastle-on-Tyne ; and

(*c*) The Institution of Engineers and Shipbuilders in Scotland, Glasgow,

two shipbuilders and two engineers being elected by each body ;

That two representatives of Steel Makers be elected by the Iron and Steel Institute, of whom one is to represent England and Wales, and the other Scotland ; also

That one representative of Forgemasters be elected by the English and Scottish Forgemasters' Association.

3. That the representatives shall be elected for a term of four years, but in the event of any vacancy occurring before the expiration of this period a representative may be elected to fill the vacancy for the unexpired portion of the term.

4. That those only who are actually partners in firms, or managers of joint stock companies, engaged in Shipbuilding, Engineering, Steelmaking, or the Manufacture of Forgings, shall be eligible for election.

5. That each Branch Committee of Lloyd's Register established abroad shall be entitled to nominate one of its Members as a representative at Meetings of the Technical Sub-Committee.

6. That additional members of the Technical Sub-Committee, not exceeding four, may be elected by the General Committee.

7. That the Chairman of the Committee of Lloyd's Register of Shipping, for the time being, or, in his absence, the Deputy-Chairman ; or, failing him, some other member of the General Committee shall preside at the meetings of the Sub-Committee.

8. That the representatives of Shipbuilders, Engineers, Steel Makers, and Forgemasters shall have the same rights and powers as the other members of the Sub-Committee in speaking and voting at the meetings of the Sub-Committee at which they are entitled to be present.

9. That it shall be open to representatives of Shipbuilders, Engineers, Steel Makers, and Forgemasters to propose alterations in, or additions to, the Rules for the construction of ships or machinery ; and that notice of all such proposals shall be sent in writing to the Secretary.

10. That meetings of the Sub-Committee shall be convened as often and at such times as may appear necessary to the General Committee, but there shall be at least two meetings in the year, though not necessarily one in each six months.

11. That every meeting shall be convened by notice from the Secretary at least one month before the date of meeting ; that the meetings shall, whenever practicable, be arranged for Tuesday afternoons; that notice of matters proposed to be brought before the Sub-Committee by members shall be sent to the Secretary not less than fourteen days before the meeting, and the Secretary shall, as soon as possible thereafter, send to each member an agenda paper.

12. That the recommendations of the Sub-Committee shall be reported to the General Committee, who will refer them for consideration to a Special Meeting of the General Committee, as required by Section 16 of the Rules.

13. That in the event of eight representatives of Shipbuilders, Engineers, Steel Makers, and Forgemasters, actually voting together on any question, and nevertheless failing to obtain a majority of the Sub-Committee, it shall be open to them to present a minority report to the General Committee.

14. That the General Committee reserve to themselves the right of varying, adding to, or rescinding, at their discretion, any or all of the foregoing Rules.

Section 18. All Reports of survey to be made in writing by the Surveyors according to the form prescribed, and submitted for the consideration of the General Committee, or of the Sub-Committees of Classification ; but the character assigned by the latter to be subject to confirmation by the General Committee.

Section 19. 1. The reports of the Surveyors, and all documents and proceedings relating to the classification of ships are to be carefully preserved and to be open to the inspection of the Owners, but no other person or persons are to have access to such documents except with the written consent of the Owners and under the direction of the Chairman, or Deputy-Chairman.

2. Copies of the original reports (if the ships be already classed, but not otherwise), so far as relates to the dimensions, scantlings, fastenings, and materials, in cases where the correctness of the reports in these particulars is certified by the builders, are granted on application.

Section 20. Ships which have been built at a port where there is not a Surveyor are to be surveyed on their arrival at a port to which a Surveyor has been appointed. In carrying out this survey, due regard is to be had to the circumstance of such vessels having been exempted from supervision while building.

Section 21. In every case in which the Character assigned to a ship may be proposed, on survey, to be reduced, notice is to be given in writing to the Owner, Master, or Agent, with an intimation that if the reduction be objected to, the Committee will be ready to direct a special survey, on the Owner, Master, or Agent agreeing to pay the expenses attending the same, provided on the said survey there shall appear sufficient ground for the proposed reduction.

Section 22. 1. When the Surveyors consider repairs to be requisite, they are respectfully to communicate the same in writing to the Owner, Master, or Agent, and if such repairs be not entered upon within a reasonable time, a corresponding report is to be made, as soon as possible, to the Committee for their decision thereon.

2. All repairs of Ships or Machinery required at Ports where there is a Surveyor to this Society, in order to their obtaining a Character in the Register Book, or to their retaining the Characters assigned to them therein, must be carried out under the inspection, and to the satisfaction of the Society's Surveyors. Ships or machinery repaired at Ports where there is no Surveyor to this Society must be surveyed by one of the Society's Surveyors at the earliest opportunity.

Section 23. Parties considering the repairs suggested by the Surveyor to be unnecessary or unreasonable may appeal to the Committee, who will direct a special survey to be held ; but should the opinion of the Surveyor be confirmed by the Committee, then the expense of such special survey is to be paid by the party appealing.

Section 24. The Surveyors to the Society not to be permitted (without the especial sanction of the Committee) to receive any fee, gratuity, or reward whatsoever for their own use or benefit, for any service performed by them in their capacity of Surveyors to this Society, on pain of immediate dismissal.

Section 25. The Surveyors will be directed to attend on Special Surveys of ships or machinery while building or under damage or repair, when required by Merchants, Shipowners, or Underwriters ;

the charge for which is to be regulated according to the nature and extent of the service performed. In all cases, the application for the assistance of the Surveyors must be made in writing addressed to the Secretary.

Section 26. While the Committee use their best endeavours to ensure that the functions of the Society are properly executed, it is to be understood that neither the Committee nor the Society are under any circumstances whatever to be held responsible for any inaccuracy in any report or certificate issued by the Society or its Surveyors, or in any entry in the Register Book or other publication of the Society, or for any error of judgment, default, or negligence of the Surveyors, or other Officers or Agents of the Society.

FUNDS.

Section 27. The Funds to be under the authority and control of the Committee, and a statement of the Receipts and Expenditure to be annually printed for the information of the Subscribers.

Section 28. The following Fees to be charged to the Owners of ships prior to their vessels being classed and registered in the book :—

Classing Fees.

For First Entry of Class in the Register Book.

For each Ship under 250 tons gross									£2	0	0
„	of	250	and under	500	tons gross				3	0	0
„	„	500	„	1,000	„				4	0	0
„	„	1,000	„	2,000	„				5	0	0
„	„	2,000	„	3,000	„				6	0	0
„	„	3,000	„	4,000	„				7	0	0
„	„	4,000	„	5,000	„				8	0	0
„	„	5,000	„	6,000	„				9	0	0
,	„	6,000	„	8,000	„				10	0	0
„	„	8,000	„	10,000	„				11	0	0
„	„	10,000 tons gross and upwards							12	0	0

For First Entry of Notification of "LMC" in the Register Book.

For each Ship under 100 nominal HP									£2	0	0
„	of	100	and under	200	nominal HP...				3	0	0
„	„	200	„	300	„ HP...				4	0	0
„	„	300	„	500	„ HP...				5	0	0
„	„	500 nominal HP and above							6	0	0

SPECIAL SURVEYS.

Section 29. 1. For ships built under the special superintendence of the Surveyors (to entitle them to the distinctive mark ✠) :—2s. per ton for the first 1,500 tons gross ; 1s. per ton for every ton from 1,501 tons to 5,000 tons gross ; 6d. per ton for every ton from 5,001 tons to 10,000 tons gross and 3d. per ton for every ton beyond 10,000 tons gross. No fee to be less than £20.

50 per cent. to be added to these fees for the Special Survey during construction of Vessels for Carrying Oil in Bulk.

2. For engines and boilers built under the special superintendence of the Surveyors (to entitle them to the distinctive mark ✠ in red) :—5s. per nominal horse-power for the first 250 horse-power ; 3s. for each horse-power from 251 to 500 ; 1s. for each horse-power from 501 to 1,000 ; and 6d. for each horse-power beyond 1,000. No fee to be less than £15.

The following rule is to be used for determining the Nominal Horse Power of Steam Reciprocating Engines in regulating the fees for their survey, viz. :—

$$NHP = \frac{P+340}{1000}\left(\frac{D^2\sqrt{S}}{100}+\frac{H}{15}\right)$$ where the boiler pressure is below 160 lbs.

$$= \frac{P+590}{1500}\left(\frac{D^2\sqrt{S}}{100}+\frac{H}{15}\right)$$ where the boiler pressure is 160 lbs. or above.

For determining the Nominal Horse Power of Steam Turbine Engines $\frac{S\ H\ P}{6}$ is to be substituted in the above formulæ for $\frac{D^2\ \sqrt{S}}{100}$, where S.H.P. is the Total Shaft Horse Power.

If the boilers are fitted with Forced Draught or Induced Draught appliances, then $\frac{H}{12}$ is to be taken instead of $\frac{H}{15}$,

where D = diameter of L.P. Cylinder in inches,
S = stroke in inches,
H = heating surface in square feet,
P = working pressure in lbs. per square inch.

The square feet of heating surface represented by H will comprise the surfaces of the tubes, of the back tube plate or plates, and of the furnace and combustion chamber plating down to the level of the fire bars.

The following rule is to be used for determining the Nominal Horse Power of Heavy Oil Engines in regulating the fees for their survey, viz. :—

$$NHP = \frac{C \times N \times D^2}{\frac{S}{D}+50}$$

where NHP = the Nominal Horse Power.
N = the number of power cylinders.
D = the diameter of the power cylinders in inches.
S = the stroke of the piston in inches. In the case of the opposed piston type of Engines S is half the combined stroke of the pistons.
C = 5 for Engines of the 4 S.C.S.A. type.
= 10 for Engines of the 4 S.C.D.A. type.
= 9 for Engines of the 2 S.C.S.A. type.
= 18 for Engines of the 2 S.C.D.A. type.
= 16 for Engines of the 2 S.C.S.A. opposed piston type.

The following rule is to be used for determining the Nominal Horse Power of Petrol and Paraffin Engines in regulating the fees for their survey, viz. :—

$$N.H.P. = \frac{B.H.P}{3{\cdot}5}$$ where B.H.P. is the Brake Horse Power at full power.

For the survey and testing of each riveted air receiver the following fees will be charged :—

For each riveted air receiver up to 200 cubic feet capacity	£2	2	0
For each riveted air receiver over 200 and up to 300 cubic feet capacity ...	3	3	0
For each riveted air receiver over 300 cubic feet capacity	4	4	0

Where seamless air receivers are made at works other than those at which the engines are constructed a fee of 10s. 6d. per receiver will be charged, provided that in no case shall the fee charged be less than £1 1s. per ship.

For the survey and testing of steam boilers fitted in Motorships, additional fees will be charged in accordance with the Society's usual scale.

3. For the survey and testing of each vertical Donkey Boiler, a fee of four guineas will be charged.

4. No charge will be made for occasional or docking surveys, at ports in Great Britain and Ireland. For the survey of damage repairs essential to the continuation of class (whether a special damage report be required or not), for the survey of repairs due to wear and tear when they are of an extensive character, for surveys with a view to the re-instatement of class, and for the survey of alterations in the structure of a vessel, a fee will be charged according to the nature and extent of the services performed.

For all surveys held at ports abroad a fee will be chargeable according to the nature and extent of the services rendered.

5. **SPECIAL PERIODICAL SURVEYS, Nos. 1, 2, and 3.**

For the Special Periodical Surveys of Iron and Steel Vessels (excepting Tugs), when such Surveys are held by the Society's Exclusive Surveyors in Great Britain and Ireland.

	S.S. No. 1.	S.S. No. 2.	S.S. No. 3.
	£ s.	£ s.	£ s.
For Vessels under 250 tons gross	5 0	... 6 0	... 8 0
„ „ 500 „	7 0	... 9 0	... 12 0
„ „ 1,000 „	9 0	... 12 0	... 15 0
„ „ 2,000 „	12 0	... 14 0	... 20 0
„ „ 4,000 „	14 0	... 16 0	... 21 0
„ „ 6,000 „	15 0	... 17 0	... 22 0
„ „ 8,000 „	16 0	... 18 0	... 23 0
„ „ 10,000 „	17 0	... 19 0	... 24 0
„ over 10,000 „	18 0	... 20 0	... 25 0

Fees for second S.S. No. 1 and subsequent Special Periodical Surveys on hulls of vessels to be 25 per cent. in excess of the above scale. Fees for Special Periodical Surveys of hulls of Vessels Carrying Oil in Bulk to be 50 per cent. in excess of the fees chargeable for other vessels.

Special Periodical Surveys of Machinery.

Held at the Special Surveys, Nos. 1, 2, and 3.

For each Ship under 50 nominal HP.	£5 0 0
„ „ 100 „	7 0 0
„ „ 200 „	10 0 0
„ „ 300 „	11 0 0
„ „ 400 „	12 0 0
„ „ 500 „	13 0 0
„ „ 1,000 „	14 0 0
„ „ 2,000 „	15 0 0
„ of 2,000 „ and above	16 0 0

For Modified Surveys of Petrol, Paraffin and Heavy Oil Engines and their Auxiliaries 50 per cent. of the fees in the above scale will be charged.

SPECIAL PERIODICAL SURVEYS, Nos. 1, 2, and 3, of TUGS.

For the Special Periodical Survey of Tugs, when such Surveys are held by the Society's Exclusive Surveyors in Great Britain and Ireland.

	S.S. No. 1.	S.S. No. 2.	S.S. No. 3.
	£ s.	£ s.	£ s.
For Vessels under 100 tons gross	3 0	... 4 0	... 5 0
„ of 100 and under 200 tons gross	4 0	... 5 0	... 7 0
„ 200 „ 300 „	5 0	... 6 0	... 8 0
„ 300 „ 400 „	6 0	... 8 0	... 10 0
„ 400 „ 500 „	7 0	... 9 0	... 12 0

Special Periodical Surveys of Machinery of Tugs.

Held at the Special Surveys, Nos. 1, 2, and 3.

For each Ship under 50 nominal HP.	£4 0 0
„ „ 75 „	5 0 0
„ „ 100 „	6 0 0

SPECIAL ANNUAL SURVEYS OF BOILERS.

To be held when and after the Boilers are six years old.

For each Ship having 1 single ended boiler	£2 0 0
And for each additional single ended boiler (including the donkey boiler)	1 0 0
But the fee in no case to be more than	10 0 0
For survey of donkey boiler of sailing vessels	2 0 0

In the cases of vessels fitted with double ended boilers, £1 to be added to the above scale for each double ended boiler, the maximum fee remaining at £10.

6. For Surveys for Restoration, Continuation, or the character A in Red, and in cases where the caulking of ships is superintended and tested by the Surveyors a charge will be made according to the nature and extent of the services rendered.

7. All repairs which may be required on the Surveys above referred to, must be performed under the superintendence of the Society's Surveyors. (*See also* **Section 22.**)

8. In all cases where travelling expenses are incurred by the Surveyors in connection with the above services, they are to be defrayed by the parties interested in the same.

Section 30. The class of a vessel is liable to be withheld, or, if already granted, may be withdrawn or expunged from the Register Book in the case of non-payment of any fees or expenses chargeable on account of such vessel.

Section 31. Certificates of Classification, signed by the Chairman, Deputy-Chairman, or Chairman of the Sub-Committees of Classification, and countersigned by the Secretary, will be granted on application.

FREEBOARD.

Section 32. Fees for the Survey for Certificate of approval of Load line, and assignment of Freeboard, in Great Britain and Ireland. (Less $8\frac{1}{3}$ per cent. discount as from April, 1927.)

	Classed Vessels.	Unclassed Vessels.
For Vessels under 100 tons gross	£2 0 0	£4 0 0
„ „ of 100 tons and under 300 tons gross... ...	2 0 0	6 0 0
„ „ 300 „ „ 500 „	3 0 0	8 0 0
„ „ 500 „ „ 1,000 „	4 0 0	11 0 0
„ „ 1,000 „ „ 1,500 „	5 0 0	14 0 0
„ „ 1,500 „ „ 2,000 „	6 0 0	17 0 0
„ „ 2,000 „ „ 2,500 „	7 0 0	20 0 0
„ „ 2,500 „ „ 3,000 „	8 0 0	23 0 0
„ every additional 1,000 tons up to 10,000 tons	1 0 0	3 0 0
„ „ „ 1,000 „ above 10,000 „	Nil	3 0 0

The same fee is to be charged for an unclassed wooden sailing or motor vessel whether opened out for survey or not.

The fee for the inspection of minor alterations involving an alteration of freeboard in a vessel having a valid load line certificate is two-fifths the full fee chargeable.

Section 33. Rules for Steel Ships, 15s.; if for Wood Ships and Composite Ships, 5s.

London, 24th April, 1930.

GENERAL REGULATIONS

RELATING TO THE

CLASSIFICATION OF STEEL VESSELS.

1. Classification. (*a*) *General.*—Steel vessels built in accordance with the Society's Rules and Regulations, or with alternative arrangements equivalent thereto, will be classed so long as they are found upon careful annual and periodical survey to be in a fit and efficient condition for the safe conveyance of dry and perishable cargo.

(*b*) *Class* 100A.—This class will be assigned to steel vessels built in accordance with the Society's Rules and Regulations and the scantlings set forth therein for vessels having the maximum draught permitted by the dimensions.

(*c*) *Class* 100A *"With Freeboard."*—This class will be assigned to steel vessels built in accordance with the Society's Rules and Regulations and the scantlings set forth therein for vessels having less than the maximum draught permitted by the dimensions, or such modification in these scantlings as may be approved in any special case by the Committee with the written consent of the owners.

(*d*) *Class* 100A *"Carrying Petroleum in Bulk."*—This class will be assigned to steel vessels built in accordance with the "Rules for the construction of vessels intended to carry petroleum in bulk." Where departures from these Rules are permitted on account of the nature of the cargo and other circumstances the class may be suitably modified. A special notation will be added to indicate the system of construction adopted.

(*e*) *Class* 100A *"For Special Service."*—Vessels in which the scantlings are equivalent to the general requirements of the Rules and the special tables for such vessels may be classed 100A, with a notation showing the particular service in which they are engaged, as—100A "Dredger."

(*f*) *Class* A *"For Special Service."*—Vessels intended for special services may receive the class A without a numeral prefixed, provided the details of the scantlings and arrangements are approved by the Committee. Where the vessel is intended for other than river or inland water service the class will be—"With Freeboard."

To the class A will be affixed notations showing the particular services for which the vessels are intended, such as "For river services"; "For towing services"; "For Channel services" and "For coasting services."

In the case of vessels intended for channel and coasting services, the particular Channel and geographical limits of coasting will be defined, *e.g.*, "Bristol Channel"; "Newhaven-Dieppe" and "Buenos Aires and Monte Video."

(*g*) *Notation for Ice Strengthening:*—Where a special notation "Strengthened for Navigation in Ice" is desired, additional strengthening is to be fitted in accordance with **Section 41.**

(*h*) *Equivalent Arrangements.*—Deviations from the Rules will be allowed provided they are submitted to the Committee and considered by them to be equivalent to the requirements of the Rules.

The builder shall obtain the owner's sanction to such deviations when the Committee deem it to be necessary.

2. Submission of Plans.—Where it is intended to build vessels for classification in the Register Book, plans of midship section and profile with deck and other plans showing the proposed dimensions, scantlings and arrangements, are to be submitted by the Builders through the local Surveyors for the approval of the Committee.

3. Special Survey during Construction.—Vessels intended for classification in the Register Book are to be built under the Society's Special Survey and vessels so built will be entitled to the distinctive mark ✠ in the Register Book.

During the progress of construction, from the laying of the keel to the completion of a vessel, it is the duty of the Surveyors to examine the material and workmanship in order to ensure that the requirements of the Rules and the approved plans are satisfactorily carried out. The Surveyors are required to point out as early as possible anything that is objectionable, or that is not in accordance with the Rules or with the plans approved by the Committee for the particular vessel.

4. Equipment.—The figure 1 placed after the character assigned to a vessel indicates that the anchors, cables, and hawsers of a vessel are in good and efficient condition and are in accordance with the requirements of the Rules.

In the case of vessels classed "For Special Services," the figure 1 indicates that the equipment is considered by the Committee to be sufficient for the particular service in which the vessel is to be engaged.

In cases in which the requirements of the Rules as to equipment have not been complied with, or in which the equipment is found to be insufficient in quantity or defective in quality, a line will be inserted in place of the figure 1, thus 100A–.

5. Main and Auxiliary Engines and Boilers. *General.*—The main and auxiliary engines and boilers of vessels intended for classification, or already classed, in the Register Book, are to be constructed under the Society's Special Survey. Appropriate records will be made in the Register Book in red, such as ✠LMC 6,29 (Lloyd's Machinery Certificate, June, 1929), or ✠NE&B 6,29 (New Engines and Boilers, June, 1929), or ✠NE 6,29, or ✠NB 6,29.

6. Novel Forms of Construction.—Where the proposed construction of a vessel or of the engines or boilers is novel in design or involves the use of unusual material, and where experience has not sufficiently justified the principle or mode of application involved, the notation "Experimental" will be inserted under the class of the vessel in the Register Book, where the Committee consider such a course is desirable.

If, in the opinion of the Committee, the engines or boilers are so inefficient as to imperil the vessel's safety, no class will be assigned to the vessel.

7. Date of Build.—The date of completion of the Special Survey of vessels built under the Society's inspection will be taken as the date of build.

8. Vessels not Built under Survey.—The requirements of the Committee for the classification of vessels which have not been built under the Society's Survey are set forth in the Rules.

9. Periodical Special Surveys. (*a*) *General.*—To entitle steel vessels to retain the characters assigned to them in the Register Book, they are required to be subjected to the Periodical Special Surveys, designated No. 1, No. 2, and No. 3, in accordance with the requirements of the Rules. These surveys become due at 4 years, 8 years, and 12 years respectively from the date of build, and subsequently at the expiration of like periods from the date of the previous Special Survey No. 3 as recorded in the Register Book.*

* Vessels built prior to 1923 and classed A "For Special Service" will be due for Special Survey at a period of four years from the date of the previous Special Survey, until the next Special Survey No. 3 is held.

In any case in which a vessel upon completion is not immediately put into commission, but is laid up for a period, the Committee, upon application by the owner, prior to the vessel's proceeding to sea, may direct an examination of the vessel to be made in dry dock by the Society's Surveyors, and if as the result of such survey the vessel as regards hull, engines, boilers and equipment (including boats) be reported in all respects free from deterioration, the periodical surveys shall become due at periods of 4, 8, and 12 years respectively from the date of such examination.

Should a vessel at any time be submitted to Special Survey No. 3 before this becomes due, the Special Surveys subsequently required will be Nos. 1, 2, and 3 at 4 years, 8 years, and 12 years respectively from the date of such Special Survey No. 3 as recorded in the Register Book.

(*b*) *Surveys held in anticipation.*—In cases in which it may suit the convenience of the owners, the Special Surveys Nos. 1 and 2 may be held at any time within 12 months previous to the dates at which they severally become due, and the Special Survey No. 3 may be held at any time before the date at which it becomes due.

(*c*) *Period allowed for completion of surveys.*—In cases where it is inconvenient for owners to fulfil all the requirements of any of the Periodical Special Surveys at the prescribed time, part only of the survey need then be carried out, provided the remainder of the survey be completed within twelve months from the date at which it became due. When a Special Survey is only partly held, the Surveyors must give the owners, or their agents, written notice of the parts not surveyed, and report the facts to the Committee.

(*d*) *Occasional Surveys.*—All vessels are subject to Annual, or Occasional Surveys when practicable. The requirements in respect of such surveys are set forth in the Rules.

(*e*) *Record of Periodical Special Surveys in Register Book.*—Vessels which have satisfactorily passed any of the Periodical Special Surveys will have notations made against their names in the Register Book indicating the survey and the date at which it was held thus :—*ss*No.1–15, *ss*No.2–19, *ss*No.3–6,23, 2nd*ss*No.3–6,35. Where Special Surveys are not completely carried out at one time, the date of Special Survey recorded in the Register Book will be the date of the survey at which the principal part of the requirements is complied with.

(*f*) *Main and Auxiliary Engines and Boilers.*—The main and auxiliary engines and boilers are to be submitted to periodical survey as required by the Rules.

10. Surveys of Repairs.—All repairs of vessels, engines and boilers that may be required in order that the vessels may retain their character in the Register Book, must be carried out under the inspection and to the satisfaction of the Society's Surveyor when one is stationed in the district. When such repairs are effected at a port where there is no Surveyor to this Society, the vessel must be surveyed by one of the Society's Surveyors at the earliest opportunity.

When the Surveyors consider repairs necessary, they are respectfully to communicate their recommendations in writing to the owner, master, or agent; and, if such repairs be not undertaken within a reasonable time, a report is to be made as soon as possible to the Committee.

11. Notice of Surveys.—The Society's Surveyors are required to attend for the purpose of holding surveys in their district, but the duty of giving notice when the attendance of the Surveyors is required to carry out Periodical Special Surveys or to supervise repairs, rests with the owners, masters, or agents. If such notice is not given, and the requisite surveys are not carried out, the characters of vessels are liable to be expunged from the Register Book.

12. Appeal from Surveyor's Recommendations.—Interested parties, considering the recommendations of the Society's Surveyors, as to the construction or repair of a vessel, to be in any case unnecessary or unreasonable, are entitled to appeal to the Committee, who will direct a special survey to be held ; but should the opinion of the Surveyor be confirmed by the Committee, the expense of such special survey is to be paid by the party appealing.

13. Certificates of Class. (*a*) *General.*—Certificates of first entry of classification and certificates of character upon subsequent completed surveys on vessels, engines, and boilers, signed by the Chairman, the Deputy-Chairman, or the Chairman of the Sub-Committees of Classification, and countersigned by the Secretary, will be granted on application.

(*b*) *Provisional Certificates.*—If the hull of a vessel has been built in accordance with the Rules, and a satisfactory report has been received from the Society's Surveyors, a provisional certificate will be issued, if desired, stating the class to which the vessel will be entitled when the engines and boilers have been fitted on board in accordance with the Rules, and the Committee's requirements otherwise complied with.

14. Reconsideration of Class.—If, upon survey of any vessel, a material reduction is found to have taken place in the thickness of the plating and angles, the classification of the vessel will be reconsidered by the Committee. In every case in which the class assigned to a vessel is proposed to be reduced, notice is to be given in writing to the owner, master, or agent, with an intimation that if the reduction be objected to, the Committee will be ready to direct a special survey, if the owner, master, or agent agrees to pay the expenses attending the same, provided on the same special survey there shall appear sufficient ground for the proposed reduction of Class.

15. Withdrawal of Class. (*a*) *Non-compliance with Rules.*—When the Rules as regards surveys on the hull, engines or boilers of a steam or motor vessel, or on the hull, masts, spars, or rigging of a sailing vessel have not been complied with, so that the vessel is not entitled to retain her class in the Register Book, the character will be expunged with a red line, under which the date of such withdrawal will be recorded.

(*b*) *Reported defects.*—When it is found from reported defects in the hull, engines or boilers of a steam or motor vessel, or in the hull, masts, spars, or rigging of a sailing vessel, that the vessel is not entitled to retain her class in the Register Book, the character will be expunged with a black line, under which the date of such withdrawal will be recorded.

(*c*) *Owner's request.*—When the class of a vessel is withdrawn from the Register Book by the Committee in consequence of a request from the owner, this will be indicated by the insertion of three dots (...) in column 7 of the Register of Steamers and column 8 of the Register of Sailing Vessels.

(*d*) *Infringement of freeboard conditions.*—Where any vessel proceeds to sea with a less freeboard than that approved by the Committee, or where the freeboard mark is placed higher on the vessel's sides than the position assigned by the Committee, the vessel's class will be liable to be expunged from the Register Book.

PERIODICAL SURVEYS OF STEEL VESSELS.

SPECIAL SURVEY No. 1.

1. The vessel is to be placed on blocks of sufficient height in a dry dock, or on a slipway; proper stages are to be made, and the holds and peaks are to be cleared for examination.

2. In vessels having a single bottom the limber boards and ceiling equal to not less than two strakes fore and aft on each side are to be removed, one such strake being taken from the bilges. Where the ceiling is fitted in hatches, the whole of the hatches and one strake of ceiling at the bilges are to be removed.

3. The coal bunkers of steam vessels are to be cleared for examination, and ceiling is to be removed as in the holds. The bilges and limbers all fore and aft are to be cleaned out, so as to allow of these parts being properly examined.

4. The framing and both surfaces of shell plating are to be exposed, and cleaned and coated where necessary. Special attention should be given to the examination of the ash shoots, and the shell plating in way of the openings.

5. In cases in which the inner surface of the bottom plating is coated with cement or asphalt, the removal of this coating may be dispensed with, provided it be carefully inspected, tested by beating or chipping, and found sound and adhering satisfactorily to the steel.

6. If the vessel has a double bottom a sufficient amount of ceiling is to be removed to enable the condition of the tank top to be ascertained, and if it is found that the plating is free from dirt and rust, the removal of the remainder of the ceiling may, in the case of the First Special Survey, be dispensed with.

7. The double bottom tanks are to be tested by a head of water to the light water-line, but in no case less than 8 feet above the inner bottom. Double bottom compartments, which are used for the carriage of oil fuel, are to be tested by a head of water extending to the load water-line, or by a head sufficient to give the maximum pressure which can come upon them in practice, whichever is the greater.

Where peak tanks or other deep tanks for carrying water ballast are fitted, their watertightness is to be tested by a head of water not less than 8 feet above the crown of the tank.

All water ballast tanks are to be cleaned out to admit of their being properly examined inside, special attention being given to the tanks under the boilers.

All peak tanks, deep tanks and bunkers specially constructed for carrying oil fuel are to be examined internally and are to be tested by a head of water equal to 30 per cent. of the depth of the tank, or 8 feet, whichever is the greater, provided the tanks are fitted with overflows or other means to prevent a greater pressure than indicated above. Where the tanks are not fitted with overflows or other similar devices, they must be tested by a head sufficient to give the maximum pressure which can be experienced in practice.

In the case of motor and other vessels burning oil fuel and carrying it in the double bottom and other tanks, upon the occasion of the First Special Survey No. 1 these tanks, with the exception of the fore and aft peak tanks, need not be examined internally, provided upon a general external examination of the tanks the Surveyor finds their condition to be satisfactory. In these cases the tanks are to be tested by a head of water of not less height than that stated in the preceding paragraph.

8. When a deck originally required to be 3 inches thick is worn to $2\frac{1}{2}$ inches, $2\frac{1}{2}$ inches to 2 inches, it is to be renewed. If, however, such deck is found on survey to be in good condition the case will, upon application, receive the consideration of the Committee.

9. The masts, spars, rigging, anchors, and general equipment of steam and sailing vessels are to be examined and either found, or placed, in good and efficient condition.

10. The hatch covers and supports throughout are to be examined in position at the hatchways, and, if defective, are to be renewed or made good.

The Surveyors should report on the efficiency of the tarpaulins, cleats, and battens, or other means of securing the hatches.

The ventilator coamings and covers are to be examined, and special care is to be taken to see that they are in an efficient condition.

11. The steering engine and its connections, the telemotor gear, the steering rods, chains, blocks, rudder, quadrant, tiller, steering gear, windlass, pumps, sluice valves, watertight doors, and air and sounding pipes are to be carefully examined, and their condition is to be stated on the Surveyor's report.

The Surveyor is to see that doubling plates are fitted under all sounding pipes.

12. Where holds are insulated for the purpose of carrying frozen or chilled meat, and the vessel in way of the insulation was examined by the Society's Surveyors at the time such insulation was fitted, it will be sufficient at the first Special Survey No. 1 to remove the limbers and hatches to enable the plating to be examined.

13. The freeboard recorded in the Register Book is to be verified.

14. The main and auxiliary engines and boilers and electric fittings are to be examined and favourably reported on by the Society's Engineer Surveyors.

For Periodical Surveys of main and auxiliary engines and boilers and electric fittings see pages 20–23.

Second and Subsequent Surveys No. 1.

1. All the requirements of Special Survey No. 1 are to be complied with.

2. In vessels having double bottoms all close ceiling is to be removed so that the inner bottom plating may be thoroughly examined. In vessels having single bottoms a sufficient amount of ceiling is to be removed to enable the structure below the ceiling to be examined.

In insulated holds, the limbers and hatches are to be removed and enough insulation is to be removed to admit of the framing and plating being examined.

3. All the double bottom tanks are to be examined internally.

4. The plating in way of the sidelights is to be examined, and if the Surveyor deems it necessary, he may require holes to be drilled in any portion of the structure where signs of wastage are evident, in order to ascertain the thickness of the material.

5. The chain cables are to be ranged for inspection, and the anchors and chains are to be examined and placed in good working condition. If any length of chain cable is found to be reduced in mean diameter at its most worn part to the extent indicated in **Table 56**, it is to be renewed.

6. The chain locker is to be examined internally.

7. All mast and bowsprit wedging is to be removed, except where the plating of masts or bowsprits is doubled in way of the wedging.

SPECIAL SURVEY No. 2.

1. The vessel is to be placed on blocks of sufficient height in a dry dock or on a slipway; proper stages are to be made, and the holds and peaks are to be cleared for examination.

2. In vessels having a single bottom, the limber boards and ceiling equal to not less than three strakes fore and aft on each side are to be removed, one such strake being taken from the bilges.

Where the ceiling is fitted in hatches, the whole of the hatches and one strake of ceiling at the bilges are to be removed.

3. The coal bunkers of steam vessels are to be cleared for examination, and ceiling is to be removed as in the holds. The bilges and limbers all fore and aft are to be cleaned out, so as to allow of these parts being properly examined.

4. The framing and both surfaces of the shell plating are to be exposed, and cleaned and coated where necessary. Special attention should be given to the examination of the ash shoots and the shell plating in way of the openings.

5. In cases in which the inner surface of the bottom plating is coated with cement or asphalt, the removal of this coating may be dispensed with, provided it be carefully inspected, tested by beating or chipping, and found sound and adhering satisfactorily to the steel.

6. If the vessel has a double bottom, an additional amount of ceiling is to be removed to enable the condition of the inner bottom plating, stanchion feet, and the bottom plating of bulkheads and tunnel sides to be examined. If the Surveyor deems it necessary, the whole of the ceiling is to be removed.

7. The double bottom tanks are to be tested by a head of water to the light water-line, but in no case less than 8 feet above the inner bottom. Double bottom compartments, which are used for the carriage of oil fuel, are to be tested by a head of water extending to the load water-line, or by a head sufficient to give the maximum pressure which can come upon them in practice, whichever is the greater.

Where peak tanks or other deep tanks for carrying water ballast are fitted, their water-tightness is to be tested by a head of water not less than 8 feet above the crown of the tank.

All double bottom tanks are to be cleaned out, to admit of their being properly examined inside, special attention being given to the tanks under the boilers.

All peak tanks, deep tanks and bunkers specially constructed for carrying oil fuel, are to be examined internally and are to be tested by a head of water equal to 30 per cent. of the depth of the tank, or 8 feet, whichever is the greater, provided the tanks are fitted with overflows or other means to

prevent a greater pressure than indicated above. Where the tanks are not fitted with overflows or other similar devices, they must be tested by a head sufficient to give the maximum pressure which can be experienced in practice.

8. The plating in way of the sidelights is to be examined, and if the Surveyor deems it necessary he may require holes to be drilled in any portion of the structure where signs of wastage are evident, in order to ascertain the thickness of the material.

9. When a deck originally required to be 3 inches thick is worn to $2\frac{1}{2}$ inches, $2\frac{1}{2}$ inches to 2 inches, it is to be renewed. If, however, such deck is found on survey to be in good condition, the case will, upon application, receive the consideration of the Committee.

10. The chain cables are to be ranged for inspection, and the anchors and chains are to be examined and placed in good working condition. If any length of chain cable is found to be reduced in mean diameter at its most worn part to the extent indicated in **Table 56**, it is to be renewed.

11. The chain locker is to be examined internally.

12. The masts, spars, rigging and general equipment are to be examined and either found, or placed, in good and efficient condition.

13. The hatch covers and supports throughout are to be examined in position at the hatchways, and, if defective, are to be renewed or made good.

The Surveyors should report on the efficiency of the tarpaulins, cleats and battens, or other means of securing the hatches.

The ventilator coamings and covers are to be examined, and special care is to be taken to see that they are in an efficient condition.

14. The steering engine and its connections, the telemotor gear, the steering rods, chains, blocks, rudder, quadrant, tiller, steering gear, windlass, pumps, sluice valves, watertight doors, and air and sounding pipes are to be carefully examined, and their condition is to be stated on the Surveyor's report.

The Surveyor is to see that doubling plates are fitted under all sounding pipes.

15. Where holds are insulated for the purpose of carrying frozen or chilled meat, and the vessel in way of the insulation was examined by the Society's Surveyors at the time such insulation was fitted, it will be sufficient at the first Special Survey No. 2 to remove the limbers and hatches to enable the plating to be examined.

16. The Freeboard recorded in the Register Book is to be verified.

17. The main and auxiliary engines and boilers and electric fittings are to be examined and favourably reported on by the Society's Engineer Surveyors.

For Periodical Surveys of main and auxiliary engines and boilers and electric fittings see pages 20–23

Second and Subsequent Special Surveys No. 2.

1. All the requirements of Special Survey No. 2 are to be complied with.

2. In vessels having double bottoms all close ceiling is to be removed so that the inner bottom plating may be thoroughly examined. In vessels having single bottoms a sufficient amount of ceiling is to be removed to enable the structure below the ceiling to be examined.

In insulated holds the limbers and hatches are to be lifted, and enough insulation is to be removed to admit of the framing and plating being examined.

3. All mast and bowsprit wedging is to be removed, except where the plating of masts or bowsprits is doubled in way of the wedging.

SPECIAL SURVEY No. 3.

1. The vessel is to be placed on blocks of sufficient height in a dry dock or on a slipway ; proper stages are to be made, and the holds and peaks are to be cleared for examination.

2. All close and spar ceiling and casings of winch, windlass, soil, scupper, and air and sounding pipes are to be removed, and the whole of the steel work exposed for examination. The plating is to be examined in way of the sidelights, and in the accommodation sufficient lining should be removed to enable this to be done. Special attention should be given to the examination of the ash shoots and the shell plating in way of the openings.

3. The coal bunkers of steam vessels are to be cleared for examination, and all ceiling is to be removed as in the holds. The bilges and limbers all fore and aft are to be cleaned out, so as to allow of these parts being properly examined.

4. All rust is to be removed from the iron and steel throughout the vessel, and the surfaces are to be re-coated.

5. In cases in which the inner surface of the bottom plating is coated with cement or asphalt, the removal of this coating may be dispensed with, provided it be carefully inspected, tested by beating or chipping, and found sound and adhering satisfactorily to the steel.

6. If the Surveyor deems it necessary, he may require holes to be drilled in any portion of the structure where signs of wastage are evident, in order to ascertain the thickness of the material.

7. Any parts of the structure which are found defective or materially less in substance than is required by the Rules are to be removed and replaced with proper materials, equal in substance and quality to that used in the original construction of the vessel.

8. The double bottom tanks are to be tested by a head of water to the light water-line, but in no case less than 8 feet above the inner bottom. Double bottom compartments which are used for the carriage of oil fuel are to be tested by a head of water extending to the load water-line, or by a head sufficient to give the maximum pressure which can come upon them in practice, whichever is the greater.

Where peak tanks or other deep tanks for carrying water ballast are fitted, their watertightness is to be tested by a head of water not less than 8 feet above the crown of the tank.

All double bottom tanks are to be cleaned out, to admit of their being properly examined inside, special attention being given to the tanks under the boilers. All peak tanks, deep tanks and bunkers specially constructed for carrying oil fuel are to be examined internally and are to be tested by a head of water equal to 30 per cent. of the depth of the tank, or 8 feet, whichever is the greater, provided the

tanks are fitted with overflows or other means to prevent a greater pressure than indicated above. Where the tanks are not fitted with overflows or other similar devices, they must be tested by a head sufficient to give the maximum pressure which can be experienced in practice.

9. When a deck originally required to be 3 inches thick is worn to $2\frac{1}{2}$ inches, $2\frac{1}{2}$ inches to 2 inches, it is to be renewed. If, however, such deck is found on survey to be in good condition, the case will, upon application, receive the consideration of the Committee.

10. The chain cables are to be ranged for inspection, and the anchors and chains are to be examined and placed in good working condition. If any length of chain cable is found to be reduced in mean diameter at its most worn part to the extent indicated in **Table 56**, it is to be renewed.

11. The chain locker is to be examined internally.

12. The masts, spars, rigging, and general equipment of steam and sailing vessels must be examined and either found, or placed, in good and efficient condition. All mast and bowsprit wedging is to be removed, whether the plating of iron or steel masts or bowsprits is doubled or not.

In sailing vessels, the standing rigging is to be lifted, and the service and parcelling stripped off the nips, bends, and splices for examination ; if, however, the rigging has been recently fitted, particulars of the cases are to be submitted for the consideration of the Committee. The bobstay pins, the deadeyes and rigging screws to the whole of the standing rigging, also all bolts or pins and fittings are to be carefully examined.

13. The hatch covers and supports throughout are to be examined in position at the hatchways and, if defective, are to be renewed or made good.

The Surveyors should report on the efficiency of the tarpaulins, cleats, and battens, or other means of securing the hatches.

The ventilator coamings and covers are to be examined, and special care is to be taken to see that they are in an efficient condition.

14. The steering engine and its connections, the telemotor gear, the steering rods, chains, blocks, rudder, quadrant, tiller, steering gear, windlass, pumps, sluice valves, watertight doors, and air and sounding pipes, are to be carefully examined, and the condition of the same is to be stated on the Surveyor's report.

The Surveyor is to see that doubling plates are fitted under all sounding pipes.

15. Where holds are insulated for the purpose of carrying frozen or chilled meat, and the vessel in way of the insulation was examined by the Society's Surveyors at the time such insulation was fitted, the limbers and hatches are to be lifted, and enough insulation is to be removed in each of the chambers to admit of the framing and plating being exposed to satisfy the Surveyors of their general condition.

16. The freeboard recorded in the Register Book is to be verified.

17. The main and auxiliary engines and boilers and electric fittings are to be examined and favourably reported on by the Society's Engineer Surveyors.

For Periodical Surveys of main and auxiliary engines and boilers and electric fittings see pages 20–23.

Second and Subsequent Special Surveys No. 3.

1. All the requirements of Special Survey No. 3 are to be complied with.

2. In steamers, the inside of the bunkers, and the parts in way of the boilers, are to receive the Surveyors' particular attention, in view of the special liability of these parts to deterioration.

3. The shell plating is to be drilled at such parts as the Surveyors may consider necessary to satisfy themselves as to the thickness. The number of holes drilled on each side of the vessel is to be in no case less than three in each strake of plating not covered with cement, the holes being drilled about amidships, and in the vicinity of the peak bulkheads. All paint as well as rust is to be entirely removed before the plates are gauged, and the actual thicknesses at all parts drilled are to be stated on a sketch which is to accompany the Surveyors' report.

The plating in way of cement in the bottom need not be drilled, provided the cement be found to be adhering satisfactorily to the plating, and the Surveyors consider drilling at this part unnecessary.

4. Where holds are insulated for the purpose of carrying frozen or chilled meat, and the vessel in way of the insulation was examined by the Society's Surveyors at the time such insulation was fitted, the limbers and hatches are to be lifted, and additional insulation is to be removed in each of the chambers to admit of the framing and plating being exposed to satisfy the Surveyors of the general condition of the same, and to enable the shell plating to be drilled as required by the Rules.

5. In cases in which a Second Special Survey No. 3 is held on a vessel before she is 24 years old, the drilling of the outside plating referred to in clause 3 may be postponed until she reaches that age; but, until the requirements as to drilling have been fully complied with, the Survey in such cases will be described in the Register Book as Special Survey No. 3.

6. In cases in which the requirements of the Second Special Survey No. 3 are fully complied with before a vessel is 24 years old, the fact will be noted in the Register Book. Such notation, however, will not exempt a vessel from compliance with the requirements of the Survey as regards drilling when she is 24 years old, or at the first Special Survey held after that time, unless the drilling has been done at the previous Special Survey.

PERIODICAL SURVEYS OF MAIN AND AUXILIARY ENGINES AND BOILERS, AND ELECTRIC FITTINGS.

ENGINES AND BOILERS OF STEAM VESSELS.

1. The machinery and boilers of all steam ships and the donkey boilers of sailing vessels are to be surveyed annually if practicable, and in addition are to be submitted to a Special Survey upon the occasions of the vessels undergoing the Special Periodical Surveys Nos. 1, 2, and 3, prescribed in the Rules, unless the machinery and boilers have been specially surveyed within a period of twelve months.

2. At these Special Surveys, and on other occasions if deemed necessary by the Surveyors, the propeller, stern-bush, sea connections, and their fastenings, are to be examined while the vessel is in dry dock.

3. The screw shaft is to be drawn at intervals of not more than three years in the cases of shafts fitted with continuous liners, and of shafts fitted with approved glands, or other approved appliances, at their after ends to permit of them being efficiently lubricated. In the cases of other screw shafts, they should be drawn at intervals of not more than two years. (On the application of owners, the Committee will be prepared to give consideration to the circumstances of any special case.)

4. The cylinders, pistons, slide valves and crank shafts of reciprocating engines, and the blading, rotor shafts, and rotors as far as practicable, of turbine engines, together with thrust and intermediate shafts, pumps and condensers, are to be examined, and if necessary the condenser is to be tested. Where reduction gears are fitted, the shafts, shaft bearings, and teeth of the gears are to be examined.

5. The valves, cocks, pipes and strainers of the pumping arrangements are to be examined.

6. The boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure; the safe working pressure is to be determined by their actual condition.

7. The steam pipes and the principal boiler mountings are to be examined and the safety valves set to the safe working pressure.

8. If satisfactory, these Surveys will be recorded in the Register Book thus:—"LMC6,29" *in red* or "B&MS6,29" *in red.*

9. "LMC" (Lloyd's Machinery Certificate) denotes that the machinery and boilers are fitted in accordance with the Rules; and when followed by a date, indicates that they were found at that time to be in good condition. "MS" with a date denotes that the engines at that time were found upon inspection to be in good condition. "BS" with a date denotes that the boilers were found upon inspection at that time to be in good condition.

10. "B&MS" (Boilers and Machinery Surveyed), with a date, denotes that the boilers and machinery, though not fitted strictly in accordance with the Rules, were found upon inspection at that time to be in good condition.

11. In the event of either the machinery or boilers appearing to be impaired to such an extent as to render it desirable that either or both be specially surveyed within the periods prescribed above, a Certificate for either machinery or boilers for a limited period will be granted according to the nature of the case.

BOILERS.

1. Water tube boilers are to be specially surveyed annually.

2. The boilers of all vessels are to be specially surveyed when six years old, and subsequently they are to be specially surveyed annually.

3. At these surveys the boilers and superheaters are to be examined internally and externally, and if deemed necessary by the Surveyors, both boilers and superheaters are to be drilled or tested by hydraulic pressure ; the safe working pressure is to be determined by their actual condition.

4. The steam pipes and the principal boiler mountings are to be examined, and the safety valves set to the safe working pressure.

5. If satisfactory these surveys will be recorded in the Register Book thus :—"BS6,29" *in red*, and "DBS6,29" *in red* respectively.

6. "BS" (Boilers Surveyed) or "DBS" (Donkey Boiler Surveyed), with a date, denotes that the boilers were found upon inspection at that time to be in good condition.

7. In the event of the boilers appearing to be impaired to such an extent as to render it desirable that they be specially surveyed within the periods prescribed above, a Certificate for a limited period will be granted according to the nature of the case.

PETROL, PARAFFIN AND HEAVY OIL ENGINES AND THEIR AUXILIARIES.

1.—(*a*) In the cases of vessels propelled by petrol, paraffin and heavy oil engines a complete survey of the machinery, as detailed in **clause 2**, is to be held upon the occasions of the vessels undergoing the Special Periodical Surveys Nos. 1, 2 and 3, prescribed in the Rules (*see* pages 13 to 19), unless the machinery has been thus surveyed within a period of twelve months.

(*b*) At each intervening period of two years a modified survey of the machinery, as detailed in **clause 3**, is to be held.

2. **Complete Periodical Survey.**—The complete periodical survey required in **clause 1, paragraph**(*a*), will consist of the following :—

(*a*) The main engines and the auxiliaries are to be examined throughout, viz., all cylinders, pistons, valves and valve gears, connecting rods and their top and bottom end brasses, crossheads, guides, pumps, clutches, reversing gears, crank, thrust and intermediate shafts, propeller, stern bush, sea connections and their fastenings.

(*b*) If compressed air is employed, the cylinders, pistons and valves of the compressors are to be examined. The air receivers are to be examined internally if possible, and, together with the air pressure pipes, are to be cleaned internally, if necessary, by means of steam, or otherwise. If the air receivers cannot be examined internally, they are to be tested by hydraulic pressure to twice the working pressure, attention being specially given in the case of welded receivers to the end and longitudinal joints.

(*c*) If electric ignition is employed the electric leads are to be examined and the system is to be tested. The magnetos are to be sent for inspection and overhaul to competent repairers.

(*d*) Where reduction gears are fitted, the shafts, shaft bearings and teeth of the gears are to be examined.

(*e*) Separate fuel storage tanks and daily service tanks, their fittings and connections are to be examined and, if deemed necessary by the Surveyor, the tanks are to be tested to the same pressure as specified for new tanks.

(*f*) The manœuvring of the engines is to be tested under working conditions.

3. **Modified Survey.**—The modified survey required in clause 1, paragraph (*b*), will consist of the following, viz.:—

(*a*) The parts of the engines which the engineers of the vessel open up for adjustment and overhaul should be examined and reported upon. The survey is to include, for each main engine, the examination of at least two pistons, with their cylinders, covers and valves, connecting rods and their top and bottom end brasses, two of the main crank shaft journals and bearings, and one of the intermediate shaft bearings. If these are all satisfactory, their condition may be taken as representing that of the other similar parts.

In the case of main engines having less than four cylinders, one of each of the parts aforementioned will be considered sufficient if found satisfactory.

Where petrol, paraffin and heavy oil engines are fitted for driving auxiliary machinery, a similar course is to be adopted, but in this case one of each of the parts aforementioned of each engine will be sufficient, if found to be satisfactory.

(*b*) The valve gears are to be examined, as far as practicable. If found to be satisfactory, they need not be dismantled.

(*c*) The pumps, air compressors and clutches (where fitted), and reversing gears, are to be examined as far as practicable. If found to be satisfactory, they need not be dismantled.

(*d*) If compressed air is employed, the air receivers are to be examined internally if possible, and, together with the air pressure pipes, are to be cleaned internally, if necessary, by means of steam, or otherwise.

(*e*) If electric ignition is employed the electric leads are to be examined and the system is to be tested. The magnetos are to be sent for inspection and overhaul to competent repairers.

(*f*) Separate fuel storage tanks and daily service tanks, their fittings and connections, are to be examined externally, and, if deemed necessary by the Surveyor, the tanks are to be tested to the same pressure as specified for new tanks.

(*g*) If the examination reveals any defects, the Surveyor should recommend such further opening up as he may consider to be necessary.

4. **Screw Shaft.**—The screw shaft is to be drawn at intervals of not more than three years in the cases of shafts fitted with continuous liners, and of shafts fitted with approved glands, or other approved appliances, at their after ends to permit of them being efficiently lubricated. In the cases of other screw shafts, they should be drawn at intervals of not more than two years. (On the application of owners, the Committee will be prepared to give consideration to the circumstances of any special case.)

5. **Record of Survey.**—If the various parts mentioned in clauses 2 or 3 are found to be in a satisfactory condition, and the Surveyor finds that the machinery generally is in good order, he should recommend the vessel to have a fresh record of LMC, or LMC(M) as the case may be.

ELECTRIC FITTINGS.

1. On the occasions of vessels undergoing the special surveys Nos. 1, 2 and 3 prescribed in the Rules, the electric installations are to be examined.

2.—(*a*) Where the electric fittings are for lighting purposes only, the installations are to be generally examined and tested under working conditions.

(*b*) The fittings on all main and sub-distribution switchboards and boxes are to be examined to ensure that the circuits are not overfused.

(*c*) The electric cables are to be examined as far as practicable without dismantling any fixtures or casings.

3.—(*a*) Where the electric generators are also used for supplying power for driving auxiliary machinery, steering gear, windlass or refrigerating machinery, the prime movers are to be opened out for examination in accordance with the Rules for the survey of Machinery set forth on pages 20 to 23 of the Rules.

(*b*) The generators and all motors driving essential auxiliary machinery are to be examined as far as practicable.

(*c*) All fittings on main and sub-distribution switchboards and boxes are to be examined to ensure that the circuits are not overfused.

(*d*) The electric cables are to be examined as far as practicable without dismantling any fixtures or casings.

(*e*) A megger test is to be made on all motors and cables, and the insulation resistance is not to be less than 100,000 ohms.

(*f*) All generators are to be run in turn or simultaneously; all main switches and current breakers are to be operated, and all lamps, heaters, motors and other appliances run, though not necessarily under full load or simultaneously.

ANNUAL OR OCCASIONAL SURVEYS OF STEEL VESSELS.

1. At annual, or occasional surveys, vessels are to be examined generally as far as possible.

2. When a vessel is placed in dry dock, or on a slipway, the Society's Surveyors at the port are to avail themselves of the opportunity to examine the bottom of the vessel, and to examine the vessel throughout, as far as practicable, in order to satisfy themselves generally as to her condition.

3. Special attention should be given to the examination of the ash shoots and the shell plating in way of the openings, and to the condition of the hatchways, ventilators, and other openings in the deck.

4. Whenever the engines or boilers are taken out, the bearers, with the floor plates, girders, rivets, and other parts of the structure, under them, are to be surveyed; and whenever the bottom plating is to be cemented, a survey is to be held prior to the cement being laid. The masts and spars are to be subject to examination by the Surveyors when deemed necessary by them on other occasions besides Special Surveys.

5. The requirements for the survey of main and auxiliary engines and boilers and electric fittings are set forth at pages 20–23.

VESSELS NOT BUILT UNDER SURVEY.

1. **Hull.**—(*a*) Where a character is required for vessels not surveyed while under construction, application must be made to the Committee in writing. Drawings, with scantlings of the vessel marked thereon, as well as particulars of the testing of the steel used in the construction of the vessel, should be furnished.

A special examination is to be made, for which purpose the vessel is to be placed on high blocks in a dry dock or on ways; the hold is to be cleared and proper stages made; the rivets and plating of the bottom are to be thoroughly examined; the close ceiling in the hold is to be removed as required for Special Survey No. 3. The coal bunkers of steam vessels are to be cleared; the whole of the frames, stringers, floor plates, keelsons, engine and boiler bearers, beam knees, watertight bulkheads rivets, and inner surface of the plating are to be exposed to view; all oxidation is to be removed from these parts and from the outside plating, rivets, keel, stem, sternpost, and rudder.

In cases where the inner surface of the bottom plating is coated with cement or asphalt, if the coating be carefully inspected, and tested by beating or chipping, and found sound and adhering satisfactorily to the steel, its removal may be dispensed with, provided that upon the removal of a portion, the plating, frames, and rivets under it be found in satisfactory condition.

(*b*) When the vessel is so prepared, the Surveyors are to ascertain the scantlings of the various parts, and verify the particulars given on the drawings furnished, drilling the shell plating and other parts where deemed necessary for this purpose. A few rivets are to be removed from various parts to ascertain their quality and the character of the countersinking and workmanship. A full report is to be made on a first entry report form in order that a character may be assigned to the vessel.

2. **Machinery.**—The engines are to be opened out for survey, at least to the extent required for the Special Surveys Nos. 1, 2 and 3; the screw shaft is to be drawn and examined, and the arrangements of sea cocks, bilge suctions, and valves, are to be made to conform to the requirements of the Rules.

The boilers are to be examined as required at Special Surveys, and the working pressure is to be determined from their actual scantlings in accordance with the Rules for the construction of boilers, and particulars should be furnished respecting the testing of the steel.

The electric fittings are to be examined as required at Special Survey.

3. **Periodical Surveys.**—The periodical surveys are subsequently to be held as in the case of vessels built under survey.

RULES FOR THE BUILDING OF STEEL VESSELS.

SUBMISSION OF PLANS.

Section 1. 1. **Submission of Plans.**—Where ships are built for classification in the Register Book, plans of Midship Section, Longitudinal Section, Decks, Scheme of Riveting, Watertight Bulkheads, Deep Tanks, Oil Fuel Bunkers, Widely Spaced Pillars and Girders, Panting Arrangements, Strengthening of Bottom Forward, Propeller Brackets, Balanced Rudder, Bossed Framing, Cruiser Stern, Large Deckhouses, and any other plans which may be required, showing the details of the scantlings and arrangements proposed, are to be submitted through the local Surveyors for the approval of the Committee before the work is commenced. Engine Seating in case of Motorships

TYPES OF VESSELS.

Section 2. 1. (*a*) The Rules and Tables give the scantlings for two basic types of vessels which are denoted—"Full Scantling Vessel" and "Complete Superstructure Vessel."

(*b*) The scantlings for the "Full Scantling Vessel" will entitle the vessel to the maximum draught that can be assigned for the dimensions of the ship.

(*c*) The scantlings for the "Complete Superstructure Vessel" will entitle the vessel to the maximum draught that can be assigned when the Depth for Freeboard Assignment is taken to the deck next below the complete superstructure deck.

(*d*) For vessels which are intermediate in character between the two basic types, the scantlings are to be determined by the interpolation between the requirements for full scantling vessels and for complete superstructure vessels in proportion to the draught desired.

(*e*) Vessels in which the draught desired is less than could be assigned as a "Complete Superstructure Vessel" may be specially considered by the Committee, and the scantlings adjusted according to the circumstances of the case and the draught desired, with the written consent of the owners.

In such cases, however, the standard of strength in relation to the draught must not be less than that represented by the two basic types referred to above.

(*f*) The class 100A will be assigned to vessels which comply with the requirements for a full scantling vessel.

(*g*) The class 100A "with freeboard" will be assigned to vessels which have a draught less than the maximum that can be assigned for the corresponding full scantling vessel.

(*h*) The Rules and Tables are framed for vessels of average ratios of breadth to depth, and of ratio of length to depth not greater than 13½. Where the proportions are abnormal, special structural arrangements will be required to secure conformity with the standard of strength of the Rules.

Determination of D in intermediate cases 460 × 60 · 35 × 2½ under ☩ draft assumed 26'-11"
I. If D = 30 × 8 = 38'-0" Hull at Full scantlings draft 28'-10 3/4
II. If D is taken between deck with 2½ deck assumed 8'-0" below
Hull at Full scantling draft 32.3/5
C&S draft 28'-10 1/2

Did not proceed as was decided to deal with

DETERMINATION OF SCANTLING NUMERALS.

Section 3. 1. **Principal Dimensions.**—(*a*) **The Length (L)** is to be measured from the fore side of the stem to the after side of the sternpost on the summer load water line.

The length (L) of vessels having cruiser sterns is to be taken as 96 per cent. of the extreme length measured from the fore side of the stem to the aftermost part of the cruiser stern, but is not to be less than the length from the fore side of the stem to the after side of sternpost, or to the centre of the rudder stock where a sternpost is not fitted.

(*b*) **The Breadth (B)** is to be the greatest moulded breadth of the vessel.

(*c*) **The Depth (D)** is to be measured at the middle of length, from the top of keel to the top of beam at side of uppermost continuous deck. Where the draught desired corresponds to that which could be assigned as a Complete Superstructure vessel the depth (D) is to be measured to a point 7 feet 6 inches above the deck from which the freeboard is assigned in vessels not exceeding 300 feet in length, and 8 feet above this deck in vessels greater than 300 feet in length. Where a vessel has more than one complete tier of superstructures, (D) is to be measured to the deck next above that from which the freeboard is assigned. For the purpose of these Rules, the deck to which the depth (D) is measured is to be regarded as the upper deck except where a vessel has more than one complete tier of superstructures.

(*d*) **A Framing Depth (d)** is to be measured vertically at the middle of length, from the top of ordinary floor or the top of double bottom at side to the top of the beams at side of the lowest deck or its equivalent.

(*e*) **Proportions.**—The depth (D) is to be used in determining the proportions, except in way of a strength deck other than the upper deck, where the depth is to be taken to the strength deck. In vessels in which the depth (D) has been modified as prescribed in paragraph (*c*) on account of the draught, the depth to be used in determining the proportions is to be the actual depth to the upper deck.

2. **Scantling numerals.**—The scantlings of the principal parts of the vessel are to be determined by

(1) The depth **D**

(2) The numerals **L** × **D** and **L** × (**B** + **D**) which are to be known as the "First Longitudinal Numeral" and the "Second Longitudinal Numeral" respectively.

(3) The proportions $\frac{L}{D}$

(4) The framing depth (d)

KEELS, STEMS, AND STERNFRAMES.

Section 4. 1. **Materials.**—(*a*) Where forgings are made from scrap material, either scrap iron or scrap steel may be used, but a mixture of scrap iron and scrap steel is not to be employed.

(*b*) Where forgings are made of Ingot Steel, the requirements of **Section 10** of the **Rules for the Testing of Materials** are to be complied with.

(*c*) Where castings are used, the requirements of **Section 9** of the **Rules for the Testing of Materials** are to be complied with.

2. **Bar Keels.**—The dimensions of bar keels are to be as given in **Table 1.** The scarphs connecting the lengths of bar keel to each other and of the keel to the stem and sternframe are to have a length of nine times the thickness of the keel, and the rivet holes required in the thin ends of the scarph connections are to be drilled in position.

3. **Flat Plate Keels.**—The breadth and thickness of flat plate keels are to be as given in **Tables 18** and **19**, and intercostal keelson plates, or centre through plates, are to be connected to the keel plate by angles of the dimensions given in **Table 10** for vessels with single bottoms and as given in **Table 6** for vessels with double bottoms. The keel plates are to overlap the stem and the sternframe.

4. **Stems.**—The dimensions of the stem are to be as given in **Table 1,** but may be gradually reduced from the load waterline to the stem head where the sectional area may be 75 per cent of the Table requirements.

5. **Sternframes in Single Screw Vessels.**—(*a*) The dimensions of the sternframe are to be as given in **Table 1,** but may be gradually reduced from the lower part of the rudder trunk to its head where the sectional area may be 50 per cent of that given in the Table.

The length of the sole piece of the sternframe in way of the aperture should be kept as short as possible.

In vessels having cruiser sterns the scantlings of the rudder post should be the same as required for the propeller post.

(*b*) Where the length exceeds 275 feet the foremost or propeller post is to extend above the arch of the sternframe and is to be efficiently connected to a deep transom plate which should be attached to the adjacent deck structure where practicable.

In the case of vessels whose length does not exceed 275 feet this requirement will apply if a cruiser stern is fitted.

(*c*) The sectional area of the sole piece of the sternframe is to be at least 20 per cent greater than that of the propeller post; this increase is to be provided in the thwartship dimension of the sole piece as far as possible.

(*d*) The thickness of the boss of the propeller post is to be at least 60 per cent of the thickness of the sternframe.

(*e*) The lower portion of the sternframe forming the keel connection is to extend forward from the fore side of the propeller post a distance of three times the amidship rule frame spacing, but need not extend forward of the after peak bulkhead provided an efficient attachment is obtained to the keel.

(*f*) In steamers above 350 feet in length the shell plating is to be connected to the sternframe below the boss with three rows of rivets.

6. **Sternframes in Twin Screw Vessels.**—(*a*) In the case of twin screw steamers which have no propeller aperture, sailing vessels and paddle steamers, the dimensions of the sternframe are to be as given in **Table 1,** but may be reduced from the lower part of the rudder trunk to its head, where the sectional area should be 75 per cent of that given in the Table.

(*b*) The lower portion of the sternframe forming the keel connection is to extend forward a distance of twice the amidship rule frame spacing from the fore side of the sternframe, but need not extend forward of the aft peak bulkhead provided an efficient attachment is obtained to the keel.

7. **Sternframes–General.**—(*a*) The lower portion of the sternframe is to be flattened out to give an efficient attachment to the flat plate keel when that form of construction is adopted.

(*b*) The sternpost is to extend to the top of the transom plate and is to be connected thereto by two double riveted angles where the breadth of the post exceeds 7½ inches. The transom plate is to be ·10 inch thicker than the floors and is to have a depth of six times the thickness required for "sternframes with apertures."

(*c*) Where sternframes are made in more than one piece the scarph connections are to have a length of three times the fore and aft dimension of the sternframe and a breadth of one and a half times the fore and aft dimension of the sternframe and are to be connected by four rows of rivets. The thickness of the tips of the scarphs is to be 13 per cent of the thwartship dimension of the post.

In vessels having cruiser sterns, the scarph of the rudder post in single screw ships should not be fitted in the vertical portion of the post above the top gudgeon.

(*d*) Gudgeons are to be forged on, or cast with the sternframe, and spaced to suit the rudder arms. The upper gudgeon should be as near as practicable to the rudder trunk and rudder coupling. The gudgeons are to have a depth of 70 per cent of the rudder head and a thickness of 50 per cent of the diameter of the pintles. The depth of the bottom gudgeon is to be sufficient to take a rudder pintle having a parallel length equal to 40 per cent of the diameter of the rudder head.

(*e*) In high powered vessels and in vessels with rudders of abnormal size or proportions, a plan of the proposed arrangement of the sternframe is to be submitted for the approval of the Committee.

RUDDERS.

Section 5. 1. **Materials.**—(*a*) Where forgings are made from scrap material, either scrap iron or scrap steel may be used, but a mixture of scrap iron and scrap steel is not to be employed.

(*b*) Where forgings are made of Ingot Steel, the requirements of **Section 10** of the **Rules for the Testing of Materials** are to be complied with.

(*c*) Where castings are used, the requirements of **Section 9** of the **Rules for the Testing of Materials** are to be complied with.

2. **Scantlings.**—(*a*) The diameters of rudder heads are to be determined from **Table 41**, on the basis of the speed of the vessel in conjunction with a numeral A × D,

where A is the total area in square feet of the rudder abaft the forward edge of the main piece, and

D is the distance, in feet, of the centre of gravity of area A abaft the centre line of the pintles.

(*b*) The scantlings of the rudder arms, coupling bolts, and other details, are to be in accordance with the requirements of **Tables 42, 43** and **44**.

3. **Single Plate Rudders.**—(*a*) The main piece of single plate rudders is to have a straight taper from below the top pintle to the heel, where it is to be of the size required by **Table 43**. The diameter at the top pintle is to be not less than that of the rudder head. The arms are to be fitted on alternate sides of the plate. Small fillets to arms forged or cast on the main piece are to have a radius of not less than 20 per cent of the distance between the arms. Large fillets are to have a radius at least equal to half the distance between the arms.

(*b*) Where arms are shrunk upon and keyed to the main piece, the diameter of the latter in way of each arm is to be increased 10 per cent to admit of an efficient keyway being cut. This increase in thickness is to be uniform all round the main piece, and is to extend above and below each arm for a distance equal to the increase in diameter, from which points it is to be gradually tapered over a similar distance into the normal diameter of the main piece. The thickness of the key is to be equal to 10 per cent of the diameter of the main piece, and its breadth equal to twice its thickness.

4. **Couplings.**—Where rudder heads are coupled, the dimensions of the bolts and the flanges of the palms are to be as required by **Table 42**, and the width of material outside the bolt holes is not to be less than two-thirds the diameter of the bolts. The bolts are to be "fitted," and the nuts are to be in proportion to the size of the bolts. Locking plates, split pins, or other efficient means are to be adopted to prevent the nuts from turning. The thickness of the tips of the palms of scarphed couplings is to be 13 per cent of the diameter of the head.

5. **Pintles.**—(*a*) The pintles are to be spaced as required by **Table 43**, and the top pintle should be as near as practicable to the rudder trunk. The pintles are to have the same depth as the gudgeons, and the parallel length of the bottom bearing pintle is to be at least 40 per cent of the diameter of the rudder head.

(*b*) The pintles of double plate rudders are to be spaced as required for single plate rudders, having an arm at each pintle.

6. **Rivets.**—(*a*) The rivets in the rudder arms are to be spaced $4\frac{1}{2}$ diameters apart, centre to centre in single plate rudders, and 5 diameters apart in the bows and stays of double plate rudders.

(*b*) Where the breadth of the arm exceeds $4\frac{1}{2}$ inches, reeled riveting is to be adopted, and where the breadth of the arms exceeds 7 inches, two complete rows of rivets spaced $4\frac{1}{2}$ diameters apart in each row are to be fitted. Where two complete rows are fitted the rivets are not to be directly opposite each other except at the outer ends of the arms.

(*c*) The rivet holes in rudder plates and arms are to be countersunk, and the rivets are to have full heads and points.

SIDE FRAMING.

Section 6. 1. **Scantlings.**—(*a*) The scantlings of the side frames at the standard frame spacing are set forth in **Tables 2, 2A, 3, 3A** and **4**.

(*b*) The scantlings given in **Tables 2** and **3** are applicable to flush deck full scantling vessels. In vessels having partial superstructures the scantlings of the frames are to be intermediate between those given in **Tables 2** and **2A** or **3** and **3A** in proportion to the total percentage length of the vessel covered by superstructures, the depth (**D**) being taken to the same deck in each case. The scantlings given in **Table 4** are applicable to complete superstructure vessels.

2. **Spacing.**—The spacing of the frames from centre to centre is to be in accordance with the size of the vessel, and as required by **Tables 2, 2A, 3, 3A** and **4**.

The frame spacing is not to exceed 27 inches between the collision bulkhead and one-fifth of the vessel's length from forward and in the peaks the spacing is not to exceed 24 inches.

The frame spacing round the stern of the vessel at the knuckle may be the same as amidships, but is not in any case to be greater than 30 inches.

3. **Extent of Framing in 'Tween Decks.**—(*a*) **Full Scantling Vessels.** In way of detached superstructures the frames need only extend to the superstructure deck on alternate frames, except as follows:—

Poops.—Intermediate angle frames, which need not be attached at their lower ends, are to be fitted.

Long Bridges.—Intermediate angle frames may be dispensed with except for four frame spaces at each end of the bridge, where the frames as required in the upper 'tween decks are to be extended continuous to the bridge deck.

Short Bridges.—Intermediate angle frames which need not be attached at their lower ends are to be fitted. The arrangement of framing at each end of the bridge is to be the same as for long bridges.

Forecastles.—Intermediate angle frames are to be fitted and scarphed to the frames below or bracketed to the upper deck.

'Tween Decks below Upper Deck.—All the frames are to extend to the upper deck.

(*b*) **Complete Superstructure Vessels.**—The frames need only extend to the upper deck on alternate frames abaft one-fifth of the vessel's length from forward and forward of one-eighth of the vessel's length from aft. From these points forward and aft respectively, intermediate angle frames are to be fitted and scarphed to the frames below or bracketed to the second deck.

(*c*) The arrangements described in the above paragraphs apply only in vessels in which the Rule frame spacing is adopted and so long as such spacing does not exceed 30 inches.

In other cases the frames are to be fitted in the 'tween decks at every frame.

4. **Scantlings of Framings in 'Tween Decks.**—(*a*) **Full Scantling Vessels.** The frames in the detached superstructures where extended to the superstructure deck on alternate frames only are to have scantlings as required for bulb angle frames in peaks but may be ½ inch less in depth.

In the upper 'tween decks all the frames are to be as required for bulb angle frames in peaks but may be ½ inch less in depth.

In the second 'tween decks all the frames are to have the scantlings for required bulb angle frames in peaks.

(*b*) **Complete Superstructure Vessels.**—The frames which only extend to the upper deck on alternate frames and the frames in the second 'tween decks should have the scantlings required for bulb angle frames in peaks but may be ½ inch less in depth.

(*c*) The breadth of the shell flange of the frame is to be suitable for the diameter of the rivets in the shell plating.

(*d*) Where the framing is not continuous the 'tween deck frames are to be efficiently scarphed to the frames below.

(*e*) Where intermediate angle frames are required to be fitted, the scantlings are to be as for angle frames in peaks except those in poops and short bridges in full scantling vessels and those in the upper 'tween decks of complete superstructure vessels abaft one-eighth of the vessel's length from aft, which may be ½ inch less in depth where the depth of the frame does not exceed 6 inches, and 1 inch less in depth where the depth of the frame is over 6 inches.

(*f*) Where more than one tier of superstructures are fitted the scantlings of the framing in 'tween decks will be specially considered.

5. **Reversed Frames.**—(*a*) Where the framing consists of angle frame with reversed frame, the height to which the reversed frames are to extend is to be such as to make the strength of the framing in the 'tween decks equivalent to that specified in **clause 4** above.

(*b*) In vessels exceeding 250 feet in length, alternate reversed frames forward of the three-fifths length are to extend to the forecastle deck or to the upper deck in complete superstructure vessels in which a forecastle is not fitted.

(*c*) The overlap of frame upon reversed frame is to be not less than 4 times the diameter of the rivet.

6. **Cut Frames.**—Where frames are cut at watertight flats, they are to be attached to the plating of the deck by bracket plates of depth and breadth not less than three times the depth of peak bulb angle frames; where the 'tween deck height exceeds 8 feet 6 inches, these brackets are to be increased.

Brackets of the same thickness as the frames to which they are attached are to be fitted at every frame, and are to have not less than two rivets more than required for beam knee bracket plates of the same dimensions. At peak tanks where the flare is excessive, the brackets are to be flanged on the face and, where necessary, increased in size.

7. **General.**—(*a*) Where the height between deck stringers at the side exceeds 8 feet 6 inches at any part, additional transverse strengthening at such part is to be provided.

(*b*) Where hold frames are stopped at the lowest deck they are to be attached to the beams or bracketed to the deck stringer plate where beams are not fitted.

(*c*) The floors in the fore and aft peaks are to have the same thickness as the floors elsewhere.

(*d*) In after peaks the floors are to extend well above the stern tube but where the extension of the floor plates may not be practicable, deep cross-tie plates flanged on both upper and lower edges are to be fitted above the stern tube. The floors and cross-tie plates are to be connected to the frames with rivets spaced not more than 5 diameters apart, centre to centre. Arrangements are to be made to provide sufficient lateral rigidity to long cross-tie plates.

(*e*) In boiler rooms and permanent coal bunkers the thickness of the framing is to be increased ·06 of an inch beyond that given in the Tables.

(*f*) The rivet holes are to be punched from the faying surfaces of the frames and are not to be punched at the turn of the bilge, until the frames are bent to the required shape.

(*g*) The requirements for frames and reversed frames on the floors in single bottom vessels are given in **Section 8, clause 3.**

(*h*) Where wider frame spacing than that given in the Tables is proposed to be adopted, the requirements of **Section 14** are to be complied with.

(*i*) The requirements regarding the framing of cruiser sterns are given in **Section 24.**

(*j*) The framing in way of deep ballast tanks and oil fuel bunkers and in way of bossing for screw shafts will be specially considered and sketches showing the arrangements proposed are to be submitted for approval.

PANTING ARRANGEMENTS.

Section 7. 1. **Forward of the Collision Bulkhead.**—(*a*) Tiers of beams on alternate frames are to be fitted within the peak below the lowest deck, these tiers being spaced not more than 6 feet apart. The scantlings of the beams are to be as required for upper decks having decks below, **Table 13.**

(*b*) Stringer plates of the dimensions required for lower deck stringer plates at ends of vessel are to be fitted to each tier of panting beams.

(*c*) The stringer plates are to be attached to the outside plating by double angles or by single angles having flanges of sufficient breadth to take two complete rows of rivets.

(*d*) Frames at which there is not a beam are to be attached to the stringer plate by a knee, whose depth is to be one-half the breadth of the stringer plate.

2. **Abaft the Collision Bulkhead.** A. **Web Frame Arrangement.**—(*a*) Web frames, three or four frame spaces apart, are to be fitted for a distance, measured from the Rule position of the collision bulkhead, equal to at least 7½ per cent of the length of the vessel.

(*b*) Side stringers, spaced 6 feet apart, in line with the stringers in the peaks, are to be fitted in conjunction with the web frames and are to be extended aft beyond the web frames for three frame spaces. These stringers are to be tapered off from the aftermost web to the end, the face bar being retained throughout.

(*c*) The scantlings of the web frames and side stringers are to be in accordance with the requirements of **Table 5**, the depth (**D**) being measured to the deck below the upper deck in vessels whose draught does not exceed that which could be assigned as a Complete Superstructure vessel and the framing depth "d" being measured at the statutory position of the collision bulkhead.

(*d*) The web frames and side stringers are to be attached to the outside plating by double angles or by single angles having flanges of sufficient breadth to take two complete rows of rivets. Where the depth of hold is excessive the number of rows of rivets attaching the web frames to the shell may require to be increased.

(*e*) The web frames are to be attached to the margin plate by double angles and to the inner bottom plating by large gusset plates. Where the web frames exceed 30 inches in depth the double angles attaching the web frames to the margin plate are to have flanges of sufficient breadth to take two rows of rivets, and the floors in way of the web frames are to be attached to the margin plate by double angles, having both flanges of the same breadth as those of the angles outside the margin plate.

(*f*) The web frames are to be attached to the deck beams at their head by bracket knees of the thickness of the web frames and flanged on their inner edge. The breadth and depth of these knees are to be equal to the depth of the web frames and the dimensions are to be measured from the lower edge of the beam and the inner edge of the web frame. The knees are to be double riveted in each arm.

(*g*) The side stringers are to be attached to alternate frames by a bracket knee plate of the same depth and thickness as the stringer.

(*h*) The stringers are to be attached to the web frames by double angles of the same thickness as the web frames, and straps of the dimensions given in **Table 5** are to be fitted at the junction of the web frames and side stringers.

B. **Deep Frame Arrangement.**—(*a*) The scantlings of the side frames below the lowest deck are to be in accordance with the requirements of **Table 5A** for a distance equal to at least 10 per cent of the vessel's length, measured from the Rule position of the collision bulkhead. In vessels whose draught does not exceed that which could be assigned as a Complete Superstructure vessel, the depth (**D**) is to be measured to the deck below the upper deck.

(*b*) The rivets connecting the frames to the side plating are to be spaced $5\frac{1}{2}$ diameters apart, centre to centre.

(*c*) The gusset attachments and the corresponding rivets are to be increased 50 per cent above the requirements of **Table 8**. The number of rivets in the angles which attach the bracket plates to the margin plate are also to be 50 per cent greater than required by **Table 8**.

Where double angles are fitted connecting the bracket plates to the margin plate, the angles attaching the floors to the margin plate are also to be doubled. Where single angles double riveted are fitted, the angle attaching the floor plate to the margin plate is to have the same scantlings as the angle outside the margin, and is to be through-riveted thereto.

(*d*) Beam knees are to be in accordance with **Section 15, clause 3.**

(*e*) Side stringers, spaced 6 feet apart, are to be fitted in line with the stringers in the peak, and are to have the scantlings given in **Table 5A.** The stringers are to extend throughout the region defined in **paragraph** (*a*) above, and are to be attached to the fore peak bulkhead by a bracket, flanged on the edge, two frame spaces long each way.

(*f*) Each side stringer is to be attached to the shell plating by a single angle having a single row of rivets in each flange.

3. **Deep 'Tween Decks.**—In vessels with deep 'tween decks additional intercostal side stringers are to be fitted at the fore end, supported by web frames if considered necessary.

4. **After Peak.**—(*a*) In the after peak tiers of beams and stringers are to be fitted similar to those required in the fore peak, except that the spacing of the stringers may be 8 feet. Where the counter has excessive flare web frames and stringers or other equivalent strengthening is to be fitted where considered necessary by the Surveyors.

(*b*) Floors and cross-tie plates are to be fitted as required by **Section 6, clause 7** (*d*).

FLOOR PLATES IN VESSELS HAVING SINGLE BOTTOMS.

Section 8. 1. **Spacing.**—A floorplate is to be fitted and riveted to every frame and is to extend across the middle line, except where a vertical centre through plate is fitted, in which case the floors are to be efficiently connected to it on each side by double vertical angles having the same thickness as the centre plate.

2. **Scantlings.**—(*a*) The depth and thickness of the floor plates are to be in accordance with the requirements of **Table 9.** The thickness is to be increased above the midship thickness by ·04 inch in the engine space and by ·10 inch in the boiler space.

(*b*) The upper edges of the floor plates are not to be below the level of the upper edge at the centre line.

(*c*) Flanged bracket plates, of the same thickness as the floors, are to be fitted at the bilges, extending to a height above the base line equal to twice the depth of the floor at the centre line and having an overlap on the floor, inside the line of the frame, equal to the depth of the floor at the centre line.

(*d*) In vessels having considerable rise of floor the depth of the floor plates may be required to be increased.

(*e*) Towards the ends of the vessel the floor plates are to be gradually increased in depth in order that the sides may be efficiently connected when the brackets may be omitted.

(*f*) Floor plates forming part of bulkheads are not to be less than 36 inches in depth, measured from the top of the keel, and the thickness is to be as required for the bottom strake of bulkhead plating.

3. **Frames and Reverse Frames on Floors.**—(*a*) Where the side frames extend only to the lower turn of bilge, the frames on the floor plates are to be of the same thickness as the floor and the breadths of the flanges sufficient for the diameter of the rivet used.

(*b*) Where the side frames are carried to the centre line of the ship, the overlap of the floor plate on the frame need only be sufficient to take one row of rivets.

(*c*) The reversed bars, fitted on the upper edges of the floors, are to have flanges of the size given for reversed frames in peaks and the thickness is to be the same as that of the floor. Where reversed bars are cut, a doubling angle forming a butt strap is to be fitted having at least three rivets on each side of the butt.

(*d*) Where floors are flanged on their upper edges as a substitute for fitting reversed bars, the thickness of the floors is to be increased ·02 inch and the breadth of the flange is to be equal to the breadth of the reversed bar omitted. Floors are not to be flanged in the engine space, under boiler bearers, or in way of the strengthening of bottom forward.

(*e*) Double reversed angles, extending from side to side, are to be fitted on every floor in the engine space and under boiler bearers.

(*f*) The thickness of all the reversed bars in the boiler space is to be increased by ·10 inch.

4. **Watercourses.**—Watercourses are to be formed above the frames through all the floor plates on each side of the middle line, also at the lower turn of the bilges in vessels of full form, as well as through the vertical centre plate and intercostal keelsons, where such keelsons are fitted, in order that water may reach the pumps freely.

5. **Vessels Loading or Discharging Aground.**—In the case of small vessels intended to load or discharge while lying aground it is recommended that the bottoms be additionally strengthened in order to withstand the exceptional stresses to which they may be subjected.

6. **Strengthening of Bottom Forward.**—The requirements regarding the strengthening of the fore part of the bottom of steamers are contained in **Section 11.**

KEELSONS IN VESSELS HAVING SINGLE BOTTOMS.

Section 9. 1. **Scantlings.**—The scantlings and arrangements of keelsons are to be as required by **Table 10.**

2. **Continuity.**—Where the keelsons are cut at the bulkheads the longitudinal strength is to be efficiently maintained.

Where keelsons, or other longitudinal members are required for a certain portion of the length of a vessel, care is to be taken to avoid any abrupt discontinuity of strength at their terminations.

3. **Middle Line Keelsons.**—(*a*) All middle line keelsons are to extend as far forward and aft as practicable.

(*b*) Where flat plate keels are adopted intercostal or centre through plate keelsons are to be fitted.

(*c*) Intercostal keelsons are to be attached to the floors by single angles having the same thickness as the intercostal plates.

(*d*) Centre through plate keelsons are to have the thickness given in **Table 10**, and the floors are to be attached to them by double vertical bars of the same thickness as the keelson plate. Foundation plates of the same thickness as the centre plate and not less than 12 inches in breadth are to be fitted above the floors, one on each side of the centre keelson, and are to be attached thereto by the continuous angles.

4. **Side Keelsons.**—(*a*) Where the moulded breadth of the vessel does not exceed 30 feet, one side keelson is to be fitted on each side of the centre line, and where the breadth is above 30 feet and does not exceed 54 feet, two side keelsons are to be fitted.

All side keelsons are to extend as far forward and aft as practicable.

(*b*) Double angles, of the dimensions given in **Table 10**, or single angles of equivalent sectional area, are to be fitted on the upper edge of the keelson.

(*c*) Side keelsons are to have intercostal plates attached to the shell plating by angles of the same thickness as the intercostal plates.

(*d*) In the engine space additional side keelsons are to be fitted and are to be attached to the shell.

(*e*) Where the intercostal plates are flanged on their lower edges as a substitute for fitting attachment angles to the outside plating, their thickness is to be increased by ·02 inch. Intercostals are not to be flanged in way of the strengthening of bottom forward.

5. **Increased thickness in Boiler Room.**—The thickness of the centre and side keelson plates and bars not covered by cement is to be increased by ·10 inch in boiler rooms.

6. **Butt Connections.**—All angle and bulb angle bars of keelsons are to be in long lengths, and the butts are to be properly shifted and strapped with angles of the same thickness not less than 2 feet in length. The butts of the keelson plates are to be properly shifted and are to be riveted as required by **Table 39**. The continuous keelson angles are to be attached to the reversed frames.

7. **Strengthening of Bottom Forward.**—The requirements regarding the strengthening of the fore part of the bottom of steamers are contained in **Section 11.**

DOUBLE BOTTOMS.

Section 10. 1. **Scantlings and Arrangements.**—The scantlings and attachments of the structure forming the double bottom are to be as required by **Tables 6, 7** and **8**.

2. **Centre Girder.**—(*a*) The centre girder is to have the depth and thickness given in **Table 6.**

(*b*) In vessels not exceeding 250 feet in length, the angles attaching the centre girder to the keel plate and the inner bottom plating may be single except throughout the engine room and underneath the thrust seating and forward of the three-fifths length.

(*c*) In vessels exceeding 250 feet in length, these angles are to be double throughout.

(*d*) Single angles, double riveted, may, if desired, be fitted attaching the centre girder to the keel plate and to the inner bottom in vessels exceeding 250 feet in length, where the first longitudinal numeral does not exceed 14850.

The flanges of these angles are to be of sufficient width to take two complete rows of rivets, and the thicknesses are to be as given in **Table 6.**

In such cases double angles as required by **Table 6** are to be fitted attaching the centre girder to the inner bottom throughout the engine room, underneath the thrust seating, and from three-fifths length forward to the collision bulkhead.

Double angles, as required by **Table 6**, are also to be fitted attaching the centre girder to the keel plate from three-fifths length forward to the collision bulkhead.

3. **Side Girders.**—(*a*) One side girder is to be fitted on each side of the centre line when the rule breadth of the vessel does not exceed 58 feet, and two side girders are to be fitted when the breadth does not exceed 70 feet. Side girders are to be extended as far forward and aft as practicable.

(*b*) Additional side girders are to be fitted in way of the engine seating and thrust block seating.

(*c*) All side girders under the engine seating and thrust block are to have double angles, or single angles with flanges broad enough to take double riveting, fitted on their upper edges.

4. **Floors.**—(*a*) Solid floors of the thickness given in **Table 6** are to be fitted on every frame in the engine space and on every frame forward of the three-fifths length. They are also to be fitted under the boiler bearers and under the bulkheads. Partial solid floors are to be fitted under the thrust seating.

(*b*) In vessels engaged in heavy trades, such as ore-carrying, it is recommended that solid floors be fitted on every frame.

(*c*) Except as provided above, solid floors may be fitted on every third frame where the frame spacing is not more than 33 inches, and on every second frame where the frame spacing exceeds 33 inches.

(*d*) Bracket floors of the scantlings given in **Tables 7** and **7A** may be fitted between the solid floors required by the previous paragraph.

(*e*) The brackets attaching the frames and reversed frames to the centre girder, and to the margin plate, are to be of the same thickness as the floors, and are to be flanged on their outer edges. The breadth of the bracket plates is not to be less than three-fourths of the depth of the centre girder.

(*f*) Solid floors under machinery space, thrust block and boiler bearers, are to be attached to the centre girder by double angles or single bars double riveted. Elsewhere floors may have single attachment bars.

(*g*) On bracket floors the vertical bars at the intercostal side girders are to be of the same scantlings as the reversed frames of these floors.

(*h*) The riveted attachments of the bulb angle frames and reversed frames to the brackets at the centre line and margin plate and to the vertical stiffeners on the intercostal girder are to comply with the requirements of **Table 7A.**

Where the frames and reversed frames are angles the number of rivets is to be as required by the Table for 5 inch bulb angles.

(*i*) Where it is desired to reduce the span of bulb angle frames and reversed frames by fitting vertical struts between the side girder and centre girder, or margin plate, the scantlings of the struts and the attachments at their ends are to be as required by **Table 7A.**

(*j*) The watertight floors in the double bottom, except those under the boiler room, are to be increased ·08 inch in thickness beyond that given in the Table, and in vessels exceeding 250 feet in length are to be stiffened by vertical angles, of the size of the frame angle on floor, spaced not more than 30 inches apart.

(*k*) The spacing of the rivets in the athwartship flange of the angle attaching the floors to the margin plate is to be the same as the spacing of the rivets in the fore and aft flange.

(*l*) Additional stiffening under the heels of widely spaced pillars is to be fitted as required by **Section 16, clause 3** (*d*) and (*e*).

5. **Double Reversed Frames in Machinery Space.**—Double reversed angles, or single bars with flanges broad enough to take two complete rows of rivets, are to be fitted on every floor in the engine space, on each floor below the boiler bearers and on each floor below the thrust seating. They are to extend in all cases from the middle line to beyond the girder outside the engine seating.

6. **Inner Bottom Plating.**—(*a*) The inner bottom plating is to be continuous longitudinally, but transverse plating may be fitted in way of the watertight bulkheads provided the margin plates and middle line strake be made continuous. The attachment of the transverse plates to the longitudinal inner bottom plating is to comply with the requirements of **Table 39** but is not to be less than double riveted.

(*b*) If ceiling is not fitted on the inner bottom under the hatchways, this plating is to be increased ·08 inch in thickness in way of the hatchways. The thickness of the middle line strake is in no case to be less than that of the inner bottom plating. Where the cargo is intended to be discharged by grabs or similar mechanical appliances it is recommended that the inner bottom plating be increased ·20 inch in thickness.

7. **Margin Plates.**—(*a*) The margin plate is to be of the depth and thickness required by **Tables 6** and **8**. The full depth of the margin plate is to be maintained from the collision bulkhead to the after three-fifths length, abaft which the depth may gradually be reduced to 85 per cent of the midship depth.

(*b*) Where gusset plates are fitted connecting the outside bracket knees to the inner bottom, the horizontal flanges of the margin plates are to be of sufficient width to permit

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the landing edge of the inner bottom plating to be kept clear of the gusset plate attachment. The gusset plates are to have the same thickness as the floors.

8. **Tank Side Brackets and Angles.**—(*a*) The bracket plates connecting the side frames to the margin plate are to have the thickness given in **Table 8** and are to extend up the bilges to the height given in the same Table, this height being measured at the inner edge of the frame and maintained throughout. These brackets are to be flanged on the edge or stiffened by a reversed bar.

(*b*) Where the framing depth "d" exceeds 26 feet and the attachment outside the margin plate required by **Table 8** consists of double angles, the floor plate is also to be connected to the margin plate by double angles of the same width of flange. Where a single angle, double riveted, is fitted outside the margin plate, the fore and aft flange of the angle fitted inside is to have the same width as that of the external bar, and is to be riveted thereto.

(*c*) Where the bracket plate is attached to the margin plate by double vertical angles, the number and diameter of the rivets through the bracket plate and side framing are to be equivalent to the number and diameter of the rivets through the vertical bars, excluding the rivets in the gusset connection. Where the bracket plate is attached to the margin plate by a single angle, the number and diameter of the rivets through the bracket plate and side framing are to be equal to the number and diameter of the rivets in the vertical bar, with an addition equivalent to 50 per cent of the number of rivets in the gusset connection.

(*d*) Where the tank margin plate is approximately horizontal, the breadth of the horizontal arms of the brackets is not to be less than the rule depth of the margin plate, and is to be suitably increased to provide equivalent attachment where gussets are required by the Table.

9. **Increased Thicknesses in Machinery Space.**—(*a*) In the boiler space, including any donkey boiler recess, the floor plates and brackets, centre and side girders, inner bottom plating, margin plate and angle bars not covered by cement, and in the engine space the inner bottom plating, are to be increased in thickness as required by **Tables 6** and **7**. The thickness of the frame brackets outside the tank is to be increased ·10 inch in the boiler space.

(*b*) Where the machinery is fitted aft, the thicknesses given in **Table 6** for inner bottom plating in engine room are to be adopted throughout the engine room. In the boiler room the thicknesses are to be increased by the increments which would have been added if the machinery had been fitted amidships.

10. **Flanging.**—Floor plates are not to be flanged. Intercostals may be flanged, except under engines, thrust blocks, and pillars, and within the range of the additional strengthening of the fore part of the bottom, as required by **Section 11.** Where intercostals are flanged the thickness is to be increased by 10 per cent.

11. **Manholes and Covers.**—(*a*) Manholes with suitable steel covers are to be provided in the inner bottom plating in sufficient numbers to permit adequate ventilation, and to allow of easy access for the examination of all parts of the internal structure.

(*b*) Manholes and lightening holes are to be provided in the solid floors and intercostal side girders in such numbers and positions as will render all parts of the double bottom readily accessible. The edges of manholes should be smooth.

(*c*) Where the manhole covers are attached by bolts to the inner bottom plating, doubling plates or rims are to be fitted to receive the fastenings of the covers.

(*d*) Where ceiling is not fitted and the manhole covers or fittings to the double bottom of cargo holds project above the tank top, an angle coaming is to be fitted round each manhole with a hatch either of wood or steel.

12. **Free Passage of Air between Divisions.**—(*a*) Ample provision is to be made for the free passage of air and water from one division to another and to the air pipes, by fitting the liners short, or by having a sufficient number of holes as near to the inner bottom as possible.

(*b*) Air pipes are to be fitted in accordance with the requirements of **Section 34, clause 10.**

13. **Workmanship and Testing.**—All water-tight joints are to have the steel surfaces fitted as close as possible to each other, and are to be caulked efficiently. The double bottom is to be caulked and made water-tight, and each compartment on completion is to be tested with a head of water representing the maximum pressure which could be experienced in service.

14. **Vessels Loading or Discharging Aground.**—In the cases of small vessels intended to load or discharge while lying aground, it is recommended that the bottoms be additionally strengthened in order to withstand the exceptional stresses to which they may be subjected.

15. **Drainage.**—The pumping and draining arrangements are to be in accordance with the requirements of **Section 34, clauses 2** and **3.**

16. **Vessels carrying Oil Fuel in Double Bottom.**—The modifications required in the scantlings and arrangements of double bottoms for the carriage of oil fuel are contained in **Section 20, Sub-Sections D** to **E.**

ADDITIONAL STRENGTHENING OF THE FORE PART OF THE BOTTOM.

Section 11. 1. **Double Frames.**—(*a*) The frames are to be doubled from the three-fifths length forward to the statutory position of the collision bulkhead, from margin plate to margin plate of double bottoms, or to the lower turn of bilges where a double bottom is not fitted.

(*b*) Instead of the double bars required by the previous paragraph, single bars may be fitted having flanges each of sufficient breadth to take two complete rows of rivets.

2. **Shell Plating.**—The three strakes of shell plating next the keel are to have the midship thickness maintained to the position of the collision bulkhead as defined by the Rules. In small vessels two strakes only need have midship thickness maintained if these cover entirely the flat of bottom.

3. **Side Girders.**—(*a*) In vessels having double bottoms the spacing of the intercostal girders forward of the three-fifths length is not to exceed 8 feet, and additional intercostal girders attached to the shell and having a height of one-half the depth of the floor at that part are to be fitted extending as far forward as practicable.

(*b*) Where there is no double bottom in the fore part of a vessel, additional intercostal side keelsons are to be fitted from the three-fifths length to the position of the collision bulkhead specified in the Rules.

4. **Riveting.**—Forward of the three-fifths length, the rivets connecting the frames to the floors and plating in the bottom of vessels are to be spaced $5\frac{1}{2}$ diameters apart, centre to centre.

The seams of the shell plating are, in all cases, to be double riveted.

5. **Vessels with Engines Fitted Aft.**—Where the length of the vessel does not exceed 200 feet, the above strengthening is to be fitted from the midship half length of the vessel, and is to be extended to the position of the collision bulkhead as defined by the Rules.

6. **Flanging.**—Floor plates or intercostals are not to be flanged within the range of the strengthening required by this section.

SHELL PLATING.

Section 12. 1. **Thickness.**—(*a*) The thickness of the shell plating is given in **Tables 18** and **19** and the reduction towards the ends of the vessel is to be effected gradually.

(*b*) The strakes of shell plating next the keel are to have the midship thickness maintained forward as required by **Section 11, clause 2.**

(*c*) In single screw steamers the plates connected to the sternframe, and in twin screw steamers the plates connected to the spectacle frame and to the sternframe, are to be of the Table thickness required for the side plating amidships. Plates on the spectacle frame of twin screw steamers, and on the boss of single screw steamers, which require to be furnaced are to have the thickness required for propeller boss plates given in **Tables 18** and **19.** The shell plating is to be of increased thickness or doubled in the region of the hawse pipes.

(*d*) In way of long bridges the thickness of the upper deck sheerstrake and strake below may be as required for side plating.

(*e*) Where the breadth of the strakes of shell plating is excessive suitable compensation will be required.

2. **Shift of Butts.**—(*a*) The butts of shell plating are to be arranged to give as good a shift as possible and in adjoining strakes butts are not to be nearer each other than two frame spaces. Butts of alternate strakes, other than the strakes adjacent to flat plate keels, are not to be in the same frame space.

(*b*) The butts of the sheerstrakes are to be shifted at least two frame spaces from the butts of adjacent deck stringer plates.

3. **Fitting and Caulking of Butts and Edges.**—All outside edges of seams and butts are to be either planed or chipped fair and then carefully caulked.

Plates are to be sheared from the faying surface and if this be not done the burr caused by shearing is to be carefully removed.

4. **Openings in Topside Plating.**—(*a*) Where sidelight or other openings are cut in the sheerstrake, and the sectional area removed is greater than 20 per cent of the unpierced plate, compensation is to be provided by increasing the thickness of the plating.

(*b*) All openings in the shell plating for cargo doors, coal ports, and other purposes, are to have well-rounded corners, and arrangements are to be made to maintain the transverse and longitudinal strength in way of the openings.

5. **Liners.**—The spaces between plating and frames are to be closely fitted with liners of iron or steel which are to be in one piece and of the same breadth as the flange of the frame.

6. **Bulwark Plating.**—(*a*) The spacing between the stanchions which support the bulwarks is not to exceed 6 feet. The stanchions nearest the ends of a bridge or long poop are not to be more than 5 feet from the bridge or poop bulkhead, and are to be formed of web plates. Where the bulwark plating and main rail are cut to form a gangway or cargo port, the bulwark stays at each end of the port are to be of increased strength.

(*b*) Care is to be exercised that continuity of strength is maintained at the break of erections; and gangways, doors, and other openings in the bulwark plating are to be kept well clear of these breaks. Where mooring pipes are fitted in bulwarks, the surrounding plating is to be doubled.

DECKS.

Section 13. 1. **Steel Decks.**—(*a*) Steel decks are to be fitted in accordance with the requirements of **Tables 20 to 26.**

(*b*) The scantlings of upper, second and third decks in association with beams on every frame are to be in accordance with the requirements of **Tables 20, 21 and 26.** The scantlings for upper decks given in **Tables 20** and **21** headed "Where One Deck is Fitted," apply to the upper decks of vessels having no decks below. The heading "Where Two Decks are Fitted" refers, as indicated by the sub-headings in the Tables, to the cases where the second deck is composed of stringers and tie plates or is a complete steel deck, and the heading "Where Three Decks are Fitted" refers to vessels which have three complete steel decks.

(*c*) The thicknesses given in the Tables are associated with a tumble-home of 12 inches at the strength deck. If the tumble-home is greater or less than 12 inches the thickness of the deck plating is to be increased or may be reduced to provide the same sectional area of material. The deck plating is not, however, to be less in thickness than required by **Tables 20 to 23.**

(*d*) The thicknesses given in the Tables are those required to be fitted abreast the deck openings, which are taken to be 40 per cent of the breadth of deck amidships in the upper and second decks, and 50 per cent in the third deck. If the width of the openings on the strength deck is greater or less than specified above, the thickness of the deck plating is to be increased or may be reduced to provide the same sectional area of material; and at lower decks, if the width of the openings is greater than specified, the thickness of the plating is to be increased. The deck plating is not, however, to be less in thickness than required by **Tables 20** to **23.**

(*e*) The thicknesses given in **Table 20** are applicable to flush deck full scantling vessels. In vessels having superstructures the thickness of the deck stringer and plating is to be increased as provided in the Table in proportion to the total percentage length of superstructures fitted.

(*f*) Between the deck openings on the upper and second decks the thickness of the deck plating may be reduced within the line of the hatchway side coamings to that given in the Tables. At decks below the second deck, the thickness of the plating within the line of the hatchway side coamings may be as given in **Table 26** for deck plating at ends.

(*g*) Within a partial superstructure exceeding 15 per cent of the vessel's length the thickness of the upper deck may be as required by the Tables for a second deck, and the thickness of the second deck may be as required for a third deck.

(*h*) Where there is indication of particular concentration of loading the Committee may require additional strengthening to be fitted to the decks.

(*i*) Where the beams at unsheathed steel decks required by the Rules are not fitted at every frame, the thickness of the plating is not to be less than ·36 inch where the spacing of the beams is 44 inches, ·40 inch where the spacing of the beams is 54 inches, and ·44 inch where the spacing of the beams is 60 inches. At the sides of deck openings the thickness of the plating is not to be less than ·44 inch and this thickness is not to be reduced at the ends.

(*j*) Where the height between decks exceeds 8 feet 6 inches the thickness of the strength deck is to be increased.

(*k*) All steel decks are to be caulked, unless sheathed with a properly caulked wood deck.

(*l*) Where the length of either the engine or boiler room opening exceeds 15 feet or the combined length exceeds 30 feet, the deck abreast the openings is to be completely plated over. The plating is to extend two frame spaces beyond the opening, and is to be tapered thence to the stringer plate over a distance equal to the breadth of the plating required to be fitted.

2. **Stringer Plates.**—(*a*) Stringer plates of the dimensions given in **Tables 20** to **26** are to be fitted on the decks indicated. Deck stringer plates are to maintain the midship breadth and thickness for one-half the vessel's length amidships, and they are to be gradually reduced to the scantlings given for stringer plates at the ends of the vessel.

(*b*) Within a partial superstructure the thickness of the stringer plates may be modified in the same manner as permitted for deck plating.

(*c*) The stringer plates on all decks are to be connected to the shell plating with angle bars of the size required by **Tables 24** to **26.**

(*d*) The stringer plates of decks below the weather deck are to have an angle bar, 3 inches by 3 inches, of the same thickness as the stringer plate fitted inside the frames. The thickness of this bar need not exceed ·50 inch. The space between this angle bar and the shell plating is to be filled in with cement.

3. **Tie-plates.**—(*a*) Where steel decks are not laid, continuous tie-plates of the size given in the Tables are to be fitted on the beams upon each side of the hatchways, and tie-plates are to be riveted to the hatch end beams in order that the ends of the wood deck may be properly fastened.

(*b*) Where hatchways exceed normal breadth the deck is to be plated between the hatchway sides and the stringer plate.

(*c*) Where widely spaced pillars with girders are fitted, the scantlings of the tie-plates are to be increased.

4. **Minimum requirements for Steel Decks.**—(*a*) Unsheathed steel lower decks which are additional to those required by the Rules or for which credit is not taken in ascertaining the thickness of the upper deck are to have a thickness not less than ·30 inch where beams are fitted on every frame and not less than ·34 inch where beams are fitted on alternate frames. Where these decks are sheathed the thickness may be ·28 inch where beams are fitted on every frame and ·30 inch where beams are fitted on alternate frames.

(*b*) Unsheathed steel upper or bridge decks in vessels which do not require a steel deck by **Tables 20** and **21** are not to be less in thickness than ·28 inch for vessels 100 feet long and ·30 inch for vessels 200 feet in length where beams are fitted on every frame.

(*c*) The thickness of the stringer plate is to be ·04 inch greater than the thickness of the plating.

5. **Continuity of Strength.**—(*a*) Care is to be taken to preserve the continuity of strength at hatchways, at engine and boiler room openings and other openings and at deckhouses. For this purpose intercostal girders should be fitted below the uppermost deck and should be efficiently connected to the various coamings and casings by laps or brackets, or may be arranged to overlap in a satisfactory manner. The requirements at ends of superstructures are set forth in **Section 22, clause 4.**

(*b*) Doubling plates are to be fitted round the corners of all large openings in the strength deck plating. At the deck next below the strength deck doublings or long overlaps of the deck plating are to be fitted at the corners of the openings.

6. **Wood Decks.**—(*a*) The material employed is to be of good quality, properly seasoned, and free from sap, shakes and objectionable knots.

(*b*) The thickness of the deck is not to be less than $2\frac{1}{2}$ inches of pine or 2 inches of teak in vessels not exceeding 150 feet in length, and 3 inches and $2\frac{1}{2}$ inches for pine and teak respectively in vessels of greater length.

(*c*) Where gutter waterways are fitted at the weather deck, the angle bar forming the inner edge of the waterway is not to be less in thickness than ·36 inch.

(*d*) Thwartships planks are to be laid at the end coamings of all hatchways and deckhouses.

(*e*) The width of kauri, oregon and pitch pine planks should not exceed 5 inches, and the oregon pine should be laid with the grain vertical.

(*f*) Where deck planks are 6 inches in width or under, a single fastening will be accepted, but where the width exceeds 6 inches, two bolts are required for each plank at every beam.

The bolts are to be galvanised, nuts fitted on the under side, and properly sunk with oakum and white lead under their heads and be carefully covered over with turned dowels bedded in white lead, marine glue, or other suitable composition. Pine decks not exceeding 3 inches and teak decks not exceeding $2\frac{1}{2}$ inches in thickness are to be fastened by bolts $\frac{1}{2}$ inch in diameter; planks of greater thickness are to be fastened by bolts $\frac{5}{8}$ inch in diameter.

(*g*) All decks are to be efficiently caulked and payed.

(*h*) The requirements for wood decks in sailing ships are given in **Section 36, clause 6.**

7. **Wood Sheathing.**—Where wood sheathing is laid over a steel deck, the thickness need not exceed $2\frac{1}{2}$ inches of pine, or 2 inches if of teak. The planking is to be efficiently secured to the deck plating between the beams, and the wood deck is to be efficiently caulked and payed.

8. **Deck Compositions.**—Where owners desire to use compositions as substitutes for wood sheathing on steel decks, these decks are to be caulked and made watertight prior to the substitute being applied.

If the chemical composition of the material is such that there is a possibility of corrosive action taking place between it and the steel, it is recommended that the steel deck be coated with an approved insulating material.

9. **Water Testing.**—Weather decks and gutterways on completion are to be water tested by hose.

INCREASED FRAME SPACING.

Section 14. 1. **Increased Frame Spacing.**—(*a*) Where a spacing of frames greater than that given in the Tables is desired, the scantlings of the various parts of the structure are to be increased as specified in this Section. Where this increase in spacing exceeds 9 inches, special consideration of the scantlings and arrangements will be given.

(*b*) The frame spacing is not to exceed 27 inches between the collision bulkhead and one-fifth the vessel's length from forward, and in the peaks the spacing is not to exceed 24 inches.

2. **Double Bottom.**—(*a*) The thickness of the floor plates and tank side brackets is to be increased at the rate of ·02 inch for every 3 inches increase in spacing. The floors may be stiffened by vertical bars between the intercostal side girders instead of being increased in thickness.

(*b*) The thickness of the inner bottom plating in the holds and the tank margin plate throughout are to be increased at the rate of ·02 inch for every 4 inches increase in spacing, and the increase in the thickness of the inner bottom plating in the engine room is to be ·02 inch for every 6 inches increase in spacing. The thickness of the middle line strake need not be increased but is not to be less than the remainder of the plating.

(*c*) Where bracket floors are fitted in the double bottom, the scantlings of the frames and reversed frames are to be increased to give equivalent strength to that required by the Tables. The thickness of the bracket plates is to be the same as that of the floor plates as increased.

(*d*) The thicknesses of the material in the boiler room are to be increased by one-half the amount of the increase required in the holds.

3. **Side Framing.**—(*a*) The scantlings of the side framing in the holds and 'tween decks are to be increased so as to give equivalent strength and stiffness to the requirements of the Tables.

(*b*) All frames are to be extended to the superstructure deck where such is fitted.

4. **Shell Plating.**—The thickness of the bottom and side shell plating is to be increased at the rate of ·02 inch for every 2 inches increase in spacing. The thickness of the sheer-strake and strake below need not be increased, but is to be at least equal to the increased thickness of side shell plating.

5. **Deck Beams.**—The scantlings of the beams and beam knees are to be increased to give equivalent strength to the requirements of the Tables.

6. **Pillars.**—The scantlings of closely spaced pillars and of the corresponding runners under the deck beams are to be increased to give equivalent strength to that required by the Tables.

7. **Deck Plating.**—(*a*) The thickness of the plating of the strength deck abreast the openings will not, in general, require to be increased with increase of frame spacing. Where, however, the thickness of the plating is less than that given below, it is to be increased ·02 inch for every 4 inches increase in spacing until these thicknesses are reached.

Length of Vessel.	Increased Frame Spacing.	Thickness of Strength Deck Plating abreast Openings.
Feet.	Inches.	Inch.
250	30	·36
300	30	·38
300	36	·42
400	36	·50
500	36	·60

(*b*) The thickness of the second and third decks is to be increased ·02 inch where a spacing increased to 36 inches is adopted. This increase does not apply to the stringer plates.

(*c*) The thickness of the plating between deck openings need not be increased with increase of frame spacing.

(*d*) No increase will be required to the thickness of decks which are sheathed with wood.

8. **Middle Line Bulkhead.**—Where a middle line bulkhead is fitted the spacing of the stiffeners is not to exceed 60 inches, and the scantlings of the stiffeners are to be in accordance with the spacing adopted.

Beams. Passenger Beams in very large steamers where supported by 4 rows of pillars have been approved on the basis of 3 rows single. The modulus reduced directly as the span. In Britannic Lloyds Saloon steamer the beams of 4 row might have been approved on the basis of a stress of 5 tons/in² with 4:0 head of cargo.

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9. **Riveting.**—(*a*) The diameter of the rivets and the number of rows of rivets are to be governed by the thickness of plating required at the Rule frame spacing.

(*b*) The spacing of the rivets is to be determined by **Table 38.**

(*c*) Where the Rule frame spacing is below 28½ inches and the increase in frame spacing exceeds 3 inches, the spacing of the rivets connecting the side frames to the shell plating is to be reduced by one-half of a diameter.

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(*d*) The riveted attachment of the tank side brackets to the margin plate and to the main frames is to be increased in respect of the increased spacing adopted.

10. **General.**—In cases in which increased frame spacing is adopted, such local increases in scantlings are to be made as may be considered necessary.

BEAMS.

Section 15. 1. **Scantlings.**—(*a*) The scantlings of the beams at the various decks are set forth in **Tables 12** and **13.** Where the beam spacing is different from that shown in the Tables the scantlings of the beams are to be suitably modified.

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Beams in pens not reduced for 24" spacing. To be of angle for 27"

(*b*) Where the beams between one-fifth of the vessel's length from forward and the collision bulkhead are spaced more closely than required by **Tables 12** and **13,** they may be reduced so as to give equivalent strength to the requirements of the Tables.

(*c*) The sizes of the half beams are to be determined by the breadth of the deck amidships in conjunction with the greatest length of unsupported beam abreast openings, and are to be obtained by interpolation from the sizes given in **Tables 12** and **13** for beams supported by one, two and three rows of pillars.

For reduced frame spacing see II 6.

(*d*) The scantlings given in the Tables are applicable to a 'tween deck height of 8 feet 6 inches, and when this height is exceeded, the strength of the beams is to be increased in proportion to the increased height of 'tween decks.

(*e*) The beams of decks fitted exclusively for the accommodation of passengers may be of the size given for the beams of long bridge decks.

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(*f*) Where cargoes such as chilled beef are suspended from the beams of decks, which may, at the same time, be loaded above, the strength of the beams of cargo decks is to be increased 33 per cent where one tier of quarters is carried, 66 per cent where two tiers, and 100 per cent where three tiers are carried.

66⅔ fruit cargo

In the case of weather deck beams, this increase is to be 50 per cent for one tier, and 100 per cent for two tiers but the scantlings of these beams need not exceed those of cargo beams which have been increased for the same purpose.

(*g*) Through beams with plating are to be fitted in the machinery space at the level of each deck wherever possible, but where this is impracticable, strong beams are to be fitted.

(*h*) Where the hatchway side coamings and end beams are reinforced to compensate for the omission of side and corner pillars, the scantlings of the hatchway end beams are to be as required by **Section 16.**

(*i*) Where the line of pillars at the sides of hatchways is more than 18 inches from the coamings, the overhanging half beams will require to be efficiently reinforced or the coamings will require to be made sufficiently strong as a girder to support the deck loads.

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(*j*) Beams on which a steel deck is not fitted are to have equivalent strength to the requirements of **Tables 12** and **13.** but knees need not be increased

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(*k*) The breadth of the deck flange of the beam is to be suitable for the diameter of the rivets in the deck plating. (Generally but not locally)

3" flanges have been approved for ⅞ rivets. ⅞ rivets have been approved in the bilge where 1" rivets were required by rule.

(*l*) It is recommended that the round up of the beams of all weather decks should be equal to one-fiftieth of the breadth of the vessel.

(*m*) The requirements for beams in sailing ships are given in **Section 36, clause 4.**

II 4 Beams are not required under cupboards

Scantlings of knees not to be reduced for 3/5 L in account of 27" spacing

2. **Spacing.**—(*a*) Beams are to be fitted at every frame :— Beams not required under skids Int 2.

(1) At all watertight flats,

(2) At upper decks of all single deck vessels above 15 feet in depth,

(3) At unsheathed strength decks, except in vessels

(4) At all decks where the frame spacing exceeds 30 inches.

(*b*) The beams of upper decks in way of poops, forecastles and bridges may be fitted at alternate frames, provided that for eight frame spaces within each end of the bridge, the beams are fitted at every frame.

Section 15 Ends of 3/5 L beams may be reduced to give required strength to Tables 12/13.

(*c*) The beams of the various decks are to be placed over each other and, as far as practicable, are to be fitted to the frames which have reversed angles extended to the upper deck.

3. **Beam Knees.**—(*a*) Beams need not overlap the frames.

(*b*) The depths of beam knees are to be measured from the top of beam at side.

(*c*) The depths of beam knees are to be three times the depths of the beams given in the Tables, whether at every frame or at alternate frames.

(*d*) Where the size of the beams has been modified either for an alteration of frame spacing or of 'tween deck height or to suit special conditions of loading or support, the depth of the beam knees is to be three times the depth of the beam of bulb angle section required and the number of rivets in each arm of the knee is to be governed by the actual depth.

(*e*) The depths of the beam knees at the upper deck in vessels which have not a tier of beams below, and at the second deck in two-deck vessels where the hold frames are cut or scarphed at the second deck, are to be as required by paragraphs (*c*) and (*d*), or as given in the following Table, whichever is the greater.

The thickness of these knees is to be in accordance with **Tables 12** and **13**, or as given in the following Table for the depth of knee to be fitted, whichever is the greater.

The beam knees required by this paragraph are to be maintained throughout.

* Depth of Rule Angle, Bulb Angle or Channel Frame.	Beam Knees.		* Depth of Rule Frame formed of Channel and Reversed Angle.	Beam Knees.	
	Depth.	Minimum Thickness.		Depth.	Minimum Thickness.
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
5 or less	15	·32	13	44	·46 Fl.
7	21	·38	14	47	·46 Fl.
9	26	·44	15	50	·48 Fl.
11	31	·48			
13	36	·42 Fl.			
15	41	·44 Fl.			

* After correction for frame spacing if required.
For intermediate depths of Rule Frames the beam knees are to be obtained by interpolation.

(*f*) Where the intermediate frames in 'tween decks are omitted beam knees of ordinary dimensions are to be fitted, and the number and spacing of rivets in each flange of the angle lugs connecting the knees to the side plating are to be the same as the number and spacing of those attaching them to the beam.

(*g*) The thickness of beam knees is to be in accordance with the requirements of **Tables 12** and **13**.

(*h*) Knees 36 inches and above in depth are to be flanged on their inner edge.

Where the beam knees are flanged, the thickness may be reduced 20 per cent.

The breadth of the flange is not to be less than 2 inches in brackets not exceeding 24 inches in depth; $2\frac{1}{2}$ inches in brackets above 24 inches and not exceeding 36 inches in depth; 3 inches in brackets above 36 inches and not exceeding 44 inches in depth; and $3\frac{1}{2}$ inches in brackets exceeding 44 inches in depth.

(*i*) The number and size of the rivets in both arms of beam knees are to be as given in the following Table:—

Depth of Knee Measured from Deck.	Breadth of Knee Measured from End of Beam.	Number of Rivets.	Diameter of Rivets.
Inches.	Inches.		Inches.
14	10	4	$\frac{5}{8}$
17	12	4	$\frac{3}{4}$
21	15	5	$\frac{3}{4}$
24	17	5	$\frac{7}{8}$
28	21	6	$\frac{7}{8}$
32	24	7	$\frac{7}{8}$
36	27	8	$\frac{7}{8}$
40	31	9	$\frac{7}{8}$
44	35	10	$\frac{7}{8}$
48	39	11	$\frac{7}{8}$
52	43	12	$\frac{7}{8}$

(*j*) Half beams fitted to alternate frames are to be connected to the coaming plates with double angles; half beams fitted to every frame may be connected to the coaming plates with single angles of not less thickness than the side coaming plates. There are to be two rivets in each flange of the angles connecting coamings to the half beams where the depth of the half beam is 8 inches, three in beams $8\frac{1}{2}$ inches to $11\frac{1}{2}$ inches in depth, and four rivets where the depth is 12 inches.

4. **Rows of Pillars.**—(*a*) The numbers of rows of pillars are determined in association with the scantlings of the beams and are to comply with the requirements of **Tables 14** and **15**.

(*b*) Beams at the ends of the vessel are to be equivalent in strength and stiffness to the beams amidships having regard to the span, and the scantlings may be obtained by interpolation between columns 1, 2, and 3 of **Tables 12** and **13**.

PILLARS AND GIRDERS.

Section 16. 1. **General.**—All beams are to be supported either by closely spaced pillars or by widely spaced pillars in association with longitudinal girders under the decks. Pillars in 'tween decks and holds are to be fitted in the same vertical line.

2. **Closely Spaced Pillars.**—(*a*) Closely spaced pillars, which may be of either iron or steel, are to be fitted at alternate frames in accordance with the requirements of **Table 14**.

(*b*) In way of poops, bridges, and forecastles, the scantlings of the pillars under each deck are to be as required by the Table for the deck next below.

(*c*) Where beams are fitted at every frame, pillars are to be attached at their heads to continuous fore and aft girders of double angles having the scantlings given in **Table 14**. The girders are to be attached to each beam and to the bulkheads by angle lugs.

(*d*) The heels of pillars at inner bottoms and at tops of deep ballast tanks are to be fitted and riveted to double angle bars or tee bars.

(*e*) The heads and heels of all pillars are to have a bearing fit.

(*f*) Pillars which support decks intended exclusively for the accommodation of passengers may be $\frac{1}{8}$th inch less in diameter than required by the Table where the diameter is 3 inches, $\frac{1}{4}$ inch less where the diameter is 4 inches, and $\frac{1}{2}$ inch less where the diameter is greater than 4 inches.

(*g*) Additional pillars are to be fitted to the beams below deckhouses, windlass, steam winches and capstans, and otherwise where considered necessary.

(*h*) Where double pillars are fitted for the purpose of securing shifting boards, their diameter is to be three-fourths the diameter required for single pillars.

(*i*) Where cargoes such as chilled meat are suspended from a deck which may at the same time be loaded above, the scantlings of the pillars are to be suitably increased.

(*j*) Where pillars are fitted on a shaft tunnel, the tunnel is to be additionally strengthened under the heels of the pillars if necessary.

(*k*) Pillars made of approved weldless rolled or drawn steel tubes may be of the diameter required by **Table 14** for hollow pillars with a reduction of 25 per cent in thickness. The steel of which these tubes are made is to have a tensile strength of not less than 35 tons per square inch with an elongation of not less than 10 per cent in a length of 8 inches.

3. **Widely Spaced Pillars.**—(*a*) Where pillars are widely spaced, the scantlings are to comply with **Table 15**, and are to be determined on the basis of length of pillar in association with a numeral

$$\frac{S \times B \times H}{100}$$

where S is the fore and aft distance, in feet, from centre of span to centre of span;

B is that proportion of the breadth of deck, in feet, supported by the pillars;

H is the sum of the heights of the several superimposed 'tween decks measured, in feet, from top of beam to top of beam with an addition of 5 feet for the upper deck in Full Scantling vessels, and 4 feet for upper decks in Complete Superstructure vessels and for poop, bridge and forecastle decks.

In the case of a deck fitted exclusively for the accommodation of passengers, the height of 'tween decks may be taken as 4 feet. For superimposed superstructures exclusively devoted to such accommodation this height may be taken as 3 feet in each case.

(*b*) The scantlings given in **Table 15** are arranged for pillars made of steel having a tensile strength of from 26 to 32 tons per square inch. Where steel of 22 to 25 tons per square inch tensile strength is used, the thickness is to be increased 20 per cent beyond the requirements of the Table.

(*c*) In the 'tween decks widely spaced solid pillars, having the scantlings given in **Table 15A**, may be fitted. These pillars are to have flat palms at their heads and heels and are to be attached by rivets of the number and diameter given in the Table.

(*d*) Effective arrangements are to be made to distribute the support of the pillars to the decks and to distribute the load on the pillars at the heels.

Where non-symmetrical types of girders are fitted longitudinal and transverse supporting brackets are to be fitted in way of the heads of the pillars.

Where considered necessary by the Committee, the attachment of the floors to the intercostals and of the floors and intercostals to the inner bottom plating below the heels of pillars, will be required to have additional riveting.

Where pillars are not stepped on the tank top at the intersection of a floor and an intercostal girder, intercostals and partial solid floors are to be fitted. Manholes are not to be cut in the floors and intercostals below the heels of pillars.

(*e*) Doubling plates are to be fitted on the inner bottom plating under the heels of widely spaced tubular pillars.

(*f*) Where cargoes such as chilled meat are suspended from a deck which may at the same time be loaded above the scantlings of the pillars are to be suitably increased.

4. **Deck Girders at Heads of Widely Spaced Pillars.**—(*a*) Where widely spaced pillars are fitted, the beams between the pillars are to be supported by deck girders of the dimensions given in **Tables 16** and **17** and the scantlings of the girders are to be determined on the basis of the depth of girder in association with a numeral

$$\frac{S^2 \times B \times H}{100}$$

where S is the fore and aft spacing, in feet, of the pillars from centre to centre;

B is that proportion of the breadth of the deck, in feet, supported by the girder;

H is the height of the 'tween decks next above the girder, measured in feet, from top of beam to top of beam where the pillars in the 'tween decks are placed immediately over those below.

For upper decks in Full Scantling vessels H may be taken as 5 feet. For decks fitted exclusively for the accommodation of passengers and for upper decks in complete superstructure vessels and for poop, bridge and forecastle decks H may be taken as 4 feet.

For superimposed superstructures exclusively devoted to passenger accommodation this height may be taken as 3 feet.

Where the pillars above a deck are not placed over those below, H is to be the sum of the heights of the several 'tween decks, in feet, above the girder, with an addition as specified above for the weather deck, or, is to be increased to correspond with the additional load supported.

For 'tween deck girders abreast hatchways the numeral is to be multiplied by a factor 1·3.

(*b*) Plates, channels, bulb angles and angles forming component parts of girders, are to be fitted in long lengths and are to be efficiently strapped or lapped at the butts.

(*c*) Where girders are formed of channels, these are to be attached by two rivets either to the lower flanges of the beams, or to short angle lugs fitted to the beams.

Where girders have double lower angles, the intercostal plates are to be attached to the beams by angle lugs extending to the bottom of the girder and to the bottom of the beams alternately where beams are fitted at every frame, and to the bottom of the girder at every beam where beams are fitted at alternate frames.

Where girders have single bulb angles on the lower edge, plate brackets supporting the girder are to be fitted not more than three frame spaces apart when the beams are on every frame, or two frame spaces apart when the beams are fitted on alternate frames, and where double bulb angle girders are fitted these brackets may be four frame spaces apart. At deck girders abreast hatchways the supporting brackets are not to be more than two frame spaces apart. The beams between these plate brackets are to be attached to the girders by angle lugs, which extend alternately to the bottom of the beam and to the bottom of the girder.

(*d*) Girders are to be efficiently attached to the bulkheads by flanged brackets having a depth equal to twice the depth of the girder measured from the top of the beam, and having the same thickness as the girder plate.

(*e*) Where cargoes such as chilled meat are suspended from a deck which may at the same time be loaded above, the scantlings of the girders are to be suitably increased.

5. **Reinforced Hatchway Side Coamings and End Beams in 'Tween Decks.**—(*a*) Where the hatchway side coamings of 'tween decks are designed to act as deck girders, the scantlings are to comply with **Table 17**, and the number to be used is given by

$$1{\cdot}3 \times \frac{L^2 \times b \times H}{100}$$

where L is the length of hatchway in feet,

b is that proportion of the breadth of the deck, in feet, supported by the side coaming;

H is the height, in feet, of the 'tween decks next above the girder, measured as in **clause 4.**

(*b*) Where a hatchway side girder does not form part of a continuous fore and aft girder, it is to extend for a distance equal to two frame spaces beyond each end of the hatchway and is to be efficiently attached to the hatchway end beams by large gusset plates.

(*c*) Plate brackets are to be fitted not more than two frame spaces apart.

(*d*) Where the hatchway end beams which carry the hatchway side coamings are supported by pillars at the

centre line only, the scantlings are to comply with **Table 17**, and the numeral to be used is given by

$$\cdot 75 \times \frac{L \times b \times B \times H}{100}$$

where L, b, and H have the same meaning as in paragraph (*a*);

B is half the breadth of the deck in feet at the hatchway end beam.

(*e*) The hatch end beam knees are to be increased in breadth and thickness beyond the ordinary requirements and are to be flanged on the edge.

(*f*) The frames to which the hatchway end beams are attached are to be reinforced if considered necessary.

(*g*) In cases where deep hatchway side coamings and end beams are fitted, as at weather decks, the arrangements will be specially considered.

6. **Riveting.**—(*a*) The number of rivets in the heads and heels of solid or hollow closely spaced pillars is to be regulated by their diameter in accordance with the following Table :—

Diameter of Pillar.	Number of Rivets.	Diameter of Rivets.
Inches.		Inches.
Not exceeding $3\frac{1}{2}$...	2	$\frac{7}{8}$
Above $3\frac{1}{2}$ and not exceeding $4\frac{1}{2}$...	3	$\frac{7}{8}$
„ $4\frac{1}{2}$ „ „ „ 6 ...	4	1
„ 6	6	1

(*b*) Where pillars are fitted under watertight flats the rivet attachment is to be sufficient to withstand the load due to water pressure.

(*c*) The rivets in the seams of built tubular pillars are to be spaced not more than 5 diameters apart, centre to centre.

(*d*) The rivets in angles or channels forming pillars are to be spaced so as to close the work efficiently, and may be 7 diameters apart, centre to centre.

(*e*) The rivets in deck girders are to be spaced so as to close the work efficiently, and may be 7 diameters apart, centre to centre. The rivets in the intercostal angle are to be spaced not more than 5 diameters apart, centre to centre.

(*f*) The flanged brackets at the ends of the girders are to be double riveted to the girders and to the bulkheads.

7. **Machinery Spaces.**—(*a*) The beams in the machinery space are to be pillared as far as practicable.

(*b*) The requirements regarding the scantlings of bunker bulkheads which act as pillars are set forth in **Section 21.**

8. **Middle Line Bulkheads in lieu of Pillars.**—The requirements regarding the scantlings of non-watertight middle line bulkheads are set forth in **Section 21.**

WATERTIGHT BULKHEADS.

Section 17. 1. **Peak and Machinery Space Bulkheads.**—(*a*) A watertight collision bulkhead is to be fitted at a distance not less than 5 per cent of the vessel's length from the fore part of the stem at the waterline.

(*b*) An after peak bulkhead is to be fitted, and is to be arranged to enclose the shaft tubes in a watertight compartment.

(*c*) A bulkhead is to be fitted at each end of the machinery space.

2. **Additional Bulkheads.**—(*a*) Additional watertight bulkheads as follows are to be fitted at reasonable spacing :—

In vessels above 285 feet and not exceeding 335 feet in length, an additional watertight bulkhead is to be fitted about midway between the collision and boiler room bulkheads, making a total of five bulkheads.

In vessels above 335 feet and not exceeding 405 feet, two additional watertight bulkheads are to be fitted, one in the forward hold and one in the after hold, making a total of six bulkheads.

In vessels above 405 feet and not exceeding 470 feet, seven watertight bulkheads are to be fitted.

In vessels above 470 feet and not exceeding 540 feet, eight watertight bulkheads are to be fitted.

In vessels above 540 feet and not exceeding 610 feet, nine watertight bulkheads are to be fitted.

(*b*) Where in vessels above 220 feet and not exceeding 285 feet in length the machinery space is fitted aft, a watertight bulkhead is to be fitted about midway between the collision bulkhead and the bulkhead at the fore end of the engine and boiler space.

(*c*) In vessels in which the fitting of the number of bulkheads specified in the preceding paragraphs would interfere with the requirements of a special trade in which the vessel is to be employed, the Committee will be prepared to consider proposals from the Owner to dispense with one or more bulkheads. In all such cases suitable structural

compensation for the omission of the bulkhead will be required, and a notation will be made in the Register Book describing the number and position of the bulkheads omitted.

(*d*) For bulkheads in sailing vessels, see **Section 36.**

3. **Height of Bulkheads.**—(*a*) The collision bulkhead is to extend in all cases to the upper deck.

(*b*) In Full Scantling vessels the bulkheads are to extend to the upper deck, except the after peak bulkhead, which, subject to the approval of the Committee, may extend to the first deck above the load waterline, provided this deck forms a watertight flat from the bulkhead to the stern.

(*c*) In vessels whose draught does not exceed that which could be assigned as a Complete Superstructure vessel the bulkheads need extend to the second deck only.

(*d*) In all vessels the machinery openings within the superstructure are to be efficiently trunked.

4. **Bulkhead Plating.**—(*a*) The plating is to be not less in thickness than required by **Table 31.**

(*b*) The lowest strake is to be at least 36 inches in height, measured from the tank top, or from the keel in vessels having no double bottom, but where there is a double bottom on one side of the bulkhead only, the lowest strake is to extend at least 12 inches above the double bottom. In all cases the lowest strake is to be at least ·04 inch thicker, and in the case of a stokehold or bunker bulkhead this strake is to be ·10 inch thicker than required by the Table. Where the stokehold or bunker bulkhead forms the boundary of oil fuel tank the increase to the lowest strake need only be ·04 inch. At the end of a stokehold space the bottom plating of the bulkhead is to extend to a height not less than 24 inches above the stokehold floor.

(*c*) Plates in the limbers are to be ·10 inch thicker than required by the Table.

(*d*) The bulkhead plating is to be doubled or increased in thickness in way of the stern tube opening.

5. **Bulkhead Stiffeners.**—(*a*) Vertical stiffeners are to be fitted of the size required by **Tables 27** and **28,** spaced 30 inches apart, but this spacing may be increased up to a maximum of 36 inches, provided the strength be correspondingly increased.

The scantlings of stiffeners which are bracketed at one end and lugged at the other may be taken as a mean between those required by **Tables 27** and **28.**

(*b*) The spacing of stiffeners of collision bulkheads is not to exceed 24 inches, but the scantlings of stiffeners and thickness of plating are to be as required by **Tables 27, 28** and **31** for stiffeners spaced 30 inches apart.

(*c*) The lower end of each stiffener is to be attached to the shell plating, or to the inner bottom plating, and the bracket, or its connecting angle, is to extend to the floor adjacent to the bulkhead.

At each deck level which forms the top of a system of stiffeners, plating is to be provided of a character which will ensure horizontal rigidity in the bulkhead, and the upper brackets on the stiffeners are to be connected to angles which extend over a beam space, when beams are fitted either at every frame or at alternate frames. In the latter case the vertical flanges of the angles are to be increased in depth by 1 inch. Other effective means may be adopted for securing the necessary structural rigidity in these parts.

The distance from the heel of the boundary bar to the extremities of the arms of the brackets is to be two and one-half times the depth of the stiffener and the thickness of the brackets and number of rivets in each arm is to be as required by **Table 30.**

(*d*) Where bulkhead stiffeners are cut in way of watertight doors in the lower part of a bulkhead, the opening is to be suitably framed, and a tapered web plate, stiffened on its edge, is to be fitted on each side of the door from the base of the bulkhead to well above the door opening.

Where stiffeners are not cut, but where the space between the stiffeners has to be increased on account of watertight doors in 'tween deck bulkheads, the stiffeners at the sides of the doorway are to be suitably increased in depth and strength so that the efficiency in this neighbourhood is at least equal to that of the unpierced bulkhead, without taking the stiffness of the door frame into consideration.

(*e*) Bulkheads are to be suitably strengthened at the ends of decks girders and where subjected to concentrated deck loads if necessary.

6. **Boundary Angles.**—The bulkheads are to be attached to the outside plating, decks, and inner bottom by single angles, not less than ·10 inch thicker than the tabular thickness of the bulkhead plating to which they are attached. These angles may be single riveted, except where situated more than 35 feet below the top of the bulkhead, when they are to be double riveted in both flanges. The flanges of the angles are to be not less than 3 inches

for $\frac{3}{4}$ inch rivets, $3\frac{1}{2}$ inches for $\frac{7}{8}$ inch rivets, and 4 inches for 1 inch rivets, where single riveted, and 5 inches for $\frac{3}{4}$ inch and $\frac{7}{8}$ inch rivets, and 6 inches for 1 inch rivets where double riveted.

7. **Riveting.**—The rivets in the seams and butts of plating and in the boundary bars of bulkheads are to be spaced as required by **Table 38.** Where the distance below the bulkhead deck is more than 35 feet, the vertical connections of plates are to be double riveted. The rivets connecting stiffeners to bulkhead plating are to be spaced not more than 7 diameters, centre to centre, and, in the case of stiffeners having no bracket attachment they are to be spaced 4 diameters apart for 15 per cent of their length from each end.

8. **Caulking and Watertightness.**—All watertight bulkheads are to be carefully caulked, and their watertightness tested in accordance with **clause 13.**

In way of watertight flats the side framing is to be cut and bracketed to the deck, or watertightness is to be maintained by means of caulked angle chocks, or by cast steel or iron chocks efficiently secured and rust jointed.

9. **Watertight Recesses, Decks and Steps in Bulkheads.**—(*a*) Watertight recesses in bulkheads are to be framed and stiffened so as to provide equivalent strength and stiffness to watertight bulkheads.

(*b*) Watertight decks and steps in bulkheads are to have beams at every frame of the sizes given for stiffeners in **Table 28,** except where such beams are fitted in short lengths bracketed at each end, when they may be based on **Table 27.**

The horizontal plating is to be ·04 inch thicker than required for bulkheads under the same height from the top of the bulkhead or from the upper deck. In obtaining the necessary scantlings for beams and plating, account is to be taken of the spacing of the beams, and in no case are the sizes of these beams and thickness of plating to be less than required by **Sections 15** and **13** respectively of the Rules.

(*c*) The rivet connections of pillars are to be sufficient to withstand the load due to water pressure.

10. **Chain Lockers.**—Where chain lockers are fitted abaft the collision bulkhead, the bulkheads are to be caulked.

11. **Watertight Longitudinal Bulkheads.**—Watertight longitudinal bulkheads are to be equal in strength and stiffness to transverse bulkheads of the same depth.

12. **Watertight Doors.**—(*a*) Watertight doors are to be carefully and efficiently constructed and fitted, and strongly connected to the bulkhead, and are to be hose tested in place.

(*b*) Watertight doors are to be capable of being quickly closed from the bulkhead deck, and are to have an index at the operating position showing whether the door is open or closed. The lead of shafting is to be as direct as possible and the screw is to work in a gun-metal nut.

(*c*) Hinged watertight doors of approved pattern may be fitted in 'tween decks in approved positions. The hinges to these doors are to be fitted with gun-metal pins.

13. **Testing.**—(*a*) On completion, ordinary watertight bulkheads and deck flats are to be hose tested to the Surveyor's satisfaction.

(*b*) Fore and aft peak bulkheads which do not form the boundaries of ballast tanks are to be tested by the peaks being filled with water to a height of not less than the load waterline.

14. **Deep Tanks and Tunnels.**—The requirements for the construction of deep tanks and peak tanks are contained in **Section 19** and those for shaft tunnels in **Section 18.**

SHAFT TUNNELS.

Section 18. 1. **Tunnel.**—Where the engines are situated amidships, the shafting is to be enclosed in a watertight tunnel of dimensions which permit reasonable access for examination or repair of the shafting.

2. **Stiffeners.**—(*a*) Tunnel stiffeners are to be of the size required by **Table 32** and are to be spaced 36 inches apart. The spacing of the stiffeners may be adjusted to suit the frame spacing provided an arrangement equivalent to the Rule requirements is obtained. The foot of each stiffener is to overlap and is to be attached in all cases to the tunnel base angle, which angle is to be ·10 inch thicker than the tunnel side plating. Angle stiffeners 6 inches in depth and all bulb angle stiffeners are to be connected to the inner bottom plating by a lug.

(*b*) Where the shaft tunnel passes through a deep tank the construction is to comply with the requirements of **Section 19, clause 5.**

(*c*) Additional stiffening as may be necessary is to be provided where masts or hold pillars are stepped on the tunnel.

3. **Plating.**—The plating on the flat of tunnel sides is to be of the thickness required by **Table 31** for bulkhead plating with stiffeners spaced 36 inches apart, and the curved plating may be of the thickness required for bulkhead

plating with stiffeners spaced 30 inches apart. Where the spacing of the stiffeners exceeds 36 inches the thickness of the plating is to be increased at the rate of ·04 inch for 6 inches increase in spacing.

The top plating in way of the hatchways is to be not less than ·10 inch thicker than the remaining plates, or is to be covered with wood not less than 2 inches thick secured by bands and angles so as not to have through fastenings in the tunnel plating.

4. **Tunnel Recess.**—The plating of the top of the tunnel recess is to comply with the requirements for bulkheads. The scantlings of the beams are to be determined on the basis of their unsupported span, in conjunction with the height of cargo which they may be called upon to support, but should not be less than required for watertight flats by **Section 17, clause 9.**

The rivet connections of the pillars supporting the beams are to be sufficient to withstand the load due to water pressure.

5. **Riveting.**—Riveting and caulking are to be as required for ordinary watertight bulkheads.

6. **Entrance Door.**—The tunnel is to be provided with a watertight door on the engine room bulkhead fitted in accordance with the requirements of **Section 17, clause 12.**

7. **Pipe Tunnel.**—If a pipe tunnel is led through the forward holds, the scantlings and arrangements are to be similar to those required for a shaft tunnel.

8. **Ventilators.**—Ventilators to tunnels are to have scantlings suitable for the pressure to which they may be subjected, and are to be made watertight.

9. **Testing.**—On completion, tunnels are to be hose tested to the Surveyor's satisfaction.

DEEP TANKS AND PEAK TANKS.

Section 19. 1. **Plating.**—The thickness of the plating of the boundary bulkheads is to be as required by **Table 31** for watertight bulkhead plating with stiffeners spaced 30 inches apart. Where the height of the overflow pipe above the crown of the tank does not exceed 30 per cent of the depth of the tank, the thickness of each strake of the plating is to be governed by the depth below the top of the tank to the lower edge of strake. Where the height represented by 30 per cent is exceeded, the depth given above is to be increased by a distance equal to one-half the difference between the height to which the overflow pipe extends and the height represented by 30 per cent of the depth of the tank. In no case, however, is the thickness to be less than ·30 inch.

2. **Stiffeners.**—(*a*) The spacing of the stiffeners on the boundary bulkheads is not to exceed 24 inches.

(*b*) The stiffeners are to be of the scantlings required by **Table 34,** and are to be determined on the basis of the length of stiffener in association with the head H, measured from the crown of the tank to the top of the stiffener, which is zero where the distance in feet from the crown of the tank to the top of the overflow pipe does not exceed 30 per cent of the depth of the tank. Where the height represented by 30 per cent is exceeded, H is to be taken as one-half of the difference between the actual height to which the overflow pipe extends and the height represented by 30 per cent of the depth of the tank. The stiffeners are to be bracketed at the deck and inner bottom. The sizes of the brackets and the number of rivets are to be as required for watertight bulkhead stiffeners of the same size.

3. **Deck.**—(*a*) The beams are to be fitted on every frame with scantlings in accordance with **Table 12,** but are to be not less in strength than required for the stiffeners of the boundary bulkheads. The beams are to be supported by an efficient intercostal girder on each side of the centre line and special attention is to be paid to the riveting at the heads and heels of the quarter pillars.

(*b*) The deck plating forming the top of the tank is to be ·04 inch thicker than required for the boundary bulkheads under the same head, but is not to be less than ·34 inch with beams spaced 25 inches apart, ·40 inch with beams spaced 30 inches apart, and ·44 inch with beams spaced 36 inches apart, but the thickness of the plating is not to be less than required by **Table 26.** If the deck plating is sheathed the thickness is to be as required for the plating of boundary bulkheads, or as required by the Tables for deck plating, whichever of these is the greater.

4. **Framing.**—The side frames in deep tanks are to be increased half-an-inch in depth beyond the normal frame.

5. **Tunnel.**—(*a*) Where the shaft tunnel passes through a deep tank, the spacing of the stiffeners is to be the same as the frame spacing, and the scantlings are to be equivalent to those required by **Table 34,** and as provided in **clause 2,** the length of stiffener being taken as the height from the base of the tunnel to the top of the flat side. The ends of the stiffeners are to be bracketed to the inner bottom.

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(*b*) The thickness of the plating is to be equivalent to that required for the boundary bulkheads of the deep tank, having regard to the spacing of the stiffeners in each case.

6. **Washplates.**—Efficient washplates are to be fitted at the middle line in peak tanks; they are also to be fitted in other water ballast tanks where the breadth exceeds 30 feet.

7. **Boundary Angles.**—The boundary angles of the bulkheads are to be single riveted where the depth of the tank does not exceed 35 feet. Where this depth is exceeded, the boundary angles are to be double riveted except at the deck, where they may be single riveted.

8. **Air Pipes.**—Air pipes are to be fitted at the opposite end to that at which the filling pipes are placed, or at the highest part of the tank. Their total sectional area is not to be less than the area of the filling pipes, and they are to be carried to above the upper deck, and their discharge ends are to be always open. Ample provision is to be made for the free passage of air to prevent the formation of air pockets.

9. **Ventilators.**—'Tween deck ventilators to deep tanks are to have scantlings suitable for the pressure to which they may be subjected, and are to be made watertight.

10. **Riveting.**—The riveting is to be as required for watertight work except that the rivets through the frames and shell plating are to be spaced 5½ diameters apart, centre to centre, and the rivets attaching the stiffeners to the bulkhead plating are to be spaced 6 diameters apart, centre to centre.

11. **Testing.**—Tanks are to be tested by a head of water equal to 30 per cent of the depth of the tank, or 8 feet, whichever is the greater, provided the tanks are fitted with overflows or other means to prevent a greater pressure than the test head. Where the tanks are not fitted with overflows or other similar devices, they are to be tested by a head sufficient to give the maximum pressure which can be experienced in practice, but in no case less than 8 feet. In all cases the pressure to which the tanks will be subjected is to be indicated on the plans submitted for approval.

12.—**Bulkheads forming part of Watertight Subdivision.**—Where the boundary bulkheads of the tank form part of the watertight subdivision of the vessel, the scantlings and arrangements of these bulkheads are not to be less than required by **Section 17.**

ARRANGEMENTS FOR CARRYING AND BURNING OF OIL USED AS FUEL.

A. GENERAL.

Section 20. 1. **Flash Point.**—(*a*) The following arrangements are applicable only to the cases where the oil fuel to be carried is such that its (close test) flash point, as determined by a standard type of flash point apparatus, does not fall below 150° Fahrenheit.

(*b*) For oil fuel with a lower flash point the arrangements are to be submitted for special consideration.

2. **Record in Register Book.**—In vessels arranged to use oil as fuel, and where the requirements of this Section have been complied with, the following records will be made in the Register Book :—"Fitted for oil fuel (date) F.P. above 150° F." in cases in which approval has been given for the use of oil with a flash point above 150° Fahrenheit. The notation "Fitted for low flash oil fuel" (date) will be made in cases where the arrangements have been approved for oil fuel with a lower flash point than 150° F.

B. OIL FUEL BUNKERS.

1. **Plating.**—The thickness of the plating of the boundary bulkheads is to be as required by **Table 31** for watertight bulkheads with stiffeners spaced 30 inches apart. Where the height of the overflow pipes above the crown of the tank does not exceed 30 per cent of the depth of the tank, the thickness of each strake of the plating is to be governed by the depth below the top of the tank to the lower edge of strake. Where the height represented by 30 per cent is exceeded the depth given above is to be increased by a distance equal to one-half the difference between the height to which the overflow pipes extend and the height represented by 30 per cent of the depth of the tank. In no case, however, is the thickness to be less than ·30 inch.

2. **Stiffeners.**—(*a*) The spacing of the stiffeners on the boundary bulkheads is not to exceed 24 inches.

(*b*) The vertical stiffeners are to be as required by **Table 34,** and are to be determined on the basis of span between the horizontal supports in association with the head H, measured from the crown of the tank to the top of each span, where the distance, in feet, from the crown of the tank to the top of the overflow pipe does not exceed 30 per cent of the depth of the tank. Where this height is exceeded, H is to be increased by one-half the

difference between the actual height to which the overflow pipe extends, and the height represented by 30 per cent of the depth of the tank.

(*c*) The stiffeners are to be bracketed at the deck and inner bottom. The sizes of the brackets and the number of rivets are to be as required for watertight bulkhead stiffeners of the same scantlings.

(*d*) The vertical stiffeners on the boundary bulkheads and the side framing are to be supported by horizontal girders spaced about 8 feet apart. The scantlings of these girders are to be as required by **Table 33** and are to be determined by a numeral

$$\frac{S^2 \times D \times H}{100}$$

where S = overall length of girder, in feet.

i.e., S is the distance between the boundary bulkhead when the horizontal girders are all fitted within the compartment. Where the girders are not all fitted within the compartment S is to be increased in proportion to the increased span.

D = one-half the depth of the tank, in feet, where one horizontal girder is fitted.

= one-third the depth of the tank, in feet, where two horizontal girders are fitted.

= one-fourth the depth of the tank, in feet, where three horizontal girders are fitted.

H = the distance, in feet, from the crown of the tank to the horizontal girder where the height of the overflow pipe above the crown of the tank does not exceed 30 per cent of the depth of the tank. Where this height is exceeded, H is to be increased by a distance equal to one-half of the difference between the actual height to which the overflow pipe extends and the height represented by 30 per cent of the depth of the tank.

(*e*) The horizontal girders supporting the vertical stiffeners of the boundary bulkheads and the side framing are to be attached at their ends by flanged brackets. The toe of the bracket is not to be nearer the shell plating or the bulkhead plating than a distance equal to twice the breadth of the wider girder. The brackets are also to be double riveted in each arm.

Supporting bracket plates to the girders are to be fitted on every third stiffener or frame; the remaining stiffeners and frames are to be attached to the girders by angle lugs.

The girders are also to have supporting brackets at their intersection.

(*f*) In tanks which extend for the full breadth of the ship and which exceed 30 feet in length, the strength and stiffness of the horizontal girders are to be increased in proportion to the increased length of tank, and efficient transverse wash plate divisions may also require to be fitted if considered necessary.

(*g*) Where a steel deck abuts on an oil bunker bulkhead, the deck plating is to be attached to the bulkhead either by double angles, single riveted, or by tee bars.

3. **Tunnel.**—Where a tunnel passes through an oil fuel tank the scantlings are to be as required for a tunnel in a deep water ballast tank, but the angles attaching the tunnel plating to the inner bottom are to be double riveted.

4. **Middle Line Bulkhead and Washplates.**—(*a*) In tanks extending the full breadth of the ship a middle line bulkhead is to be fitted. Where this bulkhead is intact the construction is to be as required for the boundary bulkheads. If desired, this bulkhead may be perforated provided the total area of the openings does not exceed 10 per cent of the area of the bulkhead, in which case the horizontal girders may be dispensed with and vertical stiffeners of reduced size fitted.

(*b*) In tanks which extend for the full breadth of the ship, quarter washplates are to be fitted.

5. **Decks.**—(*a*) The beams are to be fitted on every frame with scantlings in accordance with **Table 12**, but are to be not less in strength than required for the stiffeners of the boundary bulkheads.

(*b*) The deck plating is to be as required for the crowns of deep water ballast tanks.

6. **Riveting.**—(*a*) The seams and butts of the bulkhead, deck and tunnel plating and the boundary bars, including the stringer angle, are to be double riveted. The rivets are to be spaced as required for vessels carrying oil in bulk.

(*b*) The seams of the shell plating are to be double riveted but ordinary watertight spacing may be adopted.

(*c*) The riveted connection of the horizontal girders to the bulkheads and shell plating may be by single angles, except at the ends of the girder, where they are to be double for a distance equivalent to twice the breadth of the girder. The rivets are to be spaced $4\frac{1}{2}$ diameters apart.

(*d*) In middle line bulkheads, whether perforated or not, the seams of the plating may be single riveted.

(*e*) The rivets attaching the frames to the shell plating are to be spaced $5\frac{1}{2}$ diameters apart, centre to centre. The rivets attaching the stiffeners to the bulkhead plating are to be spaced 6 diameters apart, centre to centre.

(*f*) The attachments of the frame brackets to the margin plate in way of the oil fuel bunker are to comply with the requirements of **Section 20, D 3.**

7. **Workmanship.**—(*a*) The workmanship throughout is to be of the highest character, and is to be submitted to the closest inspection.

(*b*) Plates are to be sheared from the faying surface.

(*c*) Particular attention is to be given to the removal of burrs, drillings and rimerings.

(*d*) Where holes for rivets are punched, the diameter of the punch is not to be more than $\frac{1}{16}$ inch greater than the diameter of the rivet.

Holes in liners are to be the same size as those in the plates.

Where there is difficulty in securing fairness of the holes, drilling in position should be resorted to.

(*e*) Where any unfairness exists in rivet holes, they are to be rimered and re-countersunk. Larger rivets are to be used for rimered holes.

(*f*) Surfaces of steel plates are to be fitted close to each other, and are to be caulked as far as practicable without the use of packing. Where packing is unavoidable, the material to be used should be non-soluble in oil.

(*g*) Where boundary bars consist of double angles, both flanges of each bar are to be caulked.

(*h*) Angle or T-bar connections, which are situated on a caulking side, are to be caulked.

(*i*) Attachments of fittings are to be made, as far as possible, without through fastenings. Where through bolts are fitted, they should be tapped, grommetted and set up.

8. **Ventilators.**—'Tween deck ventilators to oil fuel tanks are to have scantlings suitable to withstand the pressure to which they may be subjected and are to be made watertight. Gauze diaphragms are to be fitted over the mouths of the ventilators.

9. **Drainage.**—(*a*) Efficient means are to be provided by wells or gutterways, and sparring or lining, to prevent leakage from any of the oil fuel compartments from coming into contact with cargo, and to ensure that any such leakage shall have free drainage into the limbers or wells.

(*b*) Where there is a possibility of oil leakage from bunkers, storage tanks, settling tanks, service tanks, pumps, heaters, and other apparatus, suitable gutterways, cofferdams, drip trays, or drip screens, are to be arranged, and provision is to be made for draining these.

(*c*) Where cargo or coal is carried in a compartment adjacent to an oil fuel settling tank, which may be heated, the compartment side of the tank is to be insulated to prevent heating of the cargo or coal.

(*d*) Compartments for storing fresh water either for use in boilers or for drinking should be separated from oil compartments by cofferdams.

10. **Testing.**—Tanks are to be tested by a head of water equal to 30 per cent of the depth of the tank, or 8 feet, whichever is the greater, provided the tanks are fitted with overflows or other means to prevent the occurrence of a greater pressure than the test head above. Where the tanks are not fitted with overflows or other similar devices, they are to be tested by a head sufficient to give the maximum pressure which can be experienced in practice, but in no case less than 8 feet. In all cases the pressure to which the tanks will be subjected is to be indicated on the plans submitted for approval.

The attachment of all fittings to oil-tight surfaces should be completed before the tanks are tested. In any case, all oil-tight surfaces are to be examined prior to the completion of the vessel.

11. **Bulkheads forming part of Watertight Subdivision.**—Where the boundary bulkheads form part of the watertight subdivision of the vessel, the scantlings and arrangements of these bulkheads are not to be less than required by **Section 17.**

C. DEEP TANKS AND PEAK TANKS WHICH ARE ALWAYS FULL.

1. **Scantlings.**—(*a*) The scantlings and arrangement of stiffening are to be as prescribed above for oil fuel bunkers.

(*b*) Efficient washplates are to be fitted in peak and deep tanks.

(*c*) In deep tanks, deep webs are to be fitted to the transverse bulkheads of sufficient strength to afford adequate support to the horizontal girders on the bulkheads. These webs should be effectively associated with the washplates.

(*d*) In deep tanks, the decks are to be supported by an intercostal girder on each side of the middle line. Special attention is to be paid to the riveting at the heads and heels of the quarter pillars.

2. **Riveting.**—The riveting is to be as required for oil fuel bunkers.

3. **General.**—The arrangements regarding workmanship, ventilation, drainage and testing are to be as required for oil fuel bunkers.

D. DOUBLE BOTTOMS.

1. **General.**—(*a*) Oil fuel may be carried in ordinary cellular double bottoms.

(*b*) Holes are not to be cut in the centre girder, except in way of the narrow tanks at the ends of the vessel. The centre girder need not be caulked or tested.

(*c*) The lengths of the compartments are to be submitted for approval.

(*d*) Compartments for storing fresh water, either for use in boilers or for drinking, should be separated from oil fuel compartments by cofferdams.

2. **Riveting.**—(*a*) The thickness of the inner bottom plating may be as required by the Rules, with a minimum of ·40 inch at rule spacing, but the seams and butts are to be at least double riveted.

(*b*) Where ceiling is fitted it is to be laid on transverse battens, leaving at least two inches air space between the ceiling and tank top, and permitting free drainage from the tank top into the bilges or wells, and the thickness of the plating may be as required for double bottoms carrying water ballast.

(*c*) In all cases where oil fuel is carried in the double bottom under the engine and boiler spaces, the seams and butts of the tank top plating in way of those spaces are to be at least double riveted.

(*d*) Below an oil fuel bunker or a deep tank in which oil is carried, the seams and butts of the inner bottom plating are to be at least double riveted.

3. **Gussets.**—(*a*) Where gussets are required by **Table 8** at every frame, a continuous plate is to be fitted attaching the tank side brackets to the inner bottom, and the number of rivets attaching this plate to the tank side brackets and to the inner bottom is to be 30 per cent in excess of the number required by **Table 8.**

Where gussets are required by the Table at alternate frames, a continuous plate is to be fitted as described above, and the number of rivets attaching this plate to the tank side brackets at each frame is to be 60 per cent of the number of rivets required by **Table 8** at alternate frames.

The rivets attaching the continuous plate to the inner bottom may be spaced 5 diameters apart, but the number in each frame space is not to be less than the number connecting the plate to the tank side bracket.

Where gussets are required by the Table at every third frame, gusset plates are to be fitted at every second frame and the number of rivets in each arm is to be as specified in **Table 8** for every third frame.

Where gussets are not required by the Table, the number of rivets in the vertical bar attaching the tank side brackets to the margin plate is to be increased 40 per cent.

(*b*) The holes in the margin plates to take the gusset plate rivets are to be countersunk, and countersunk headed rivets are to be used.

(*c*) The above requirements are also to be complied with where oil fuel is carried in bunkers or deep tanks above an inner bottom compartment.

4. **Testing.**—All double bottom compartments intended for carrying oil fuel are to be tested by a head of water representing the maximum pressure which could be experienced in service.

The attachment of all fittings to oil tight surfaces should be completed before the tanks are tested. In any case, all oil tight surfaces are to be examined prior to the completion of the vessel.

5. **Workmanship.**—The workmanship and riveting are to be as required for Oil Fuel Bunkers.

E. FITTINGS AND CONTROL.

1. **Service, Settling and other Tanks.**—Where such tanks do not form part of the structure of the vessel, the scantlings and arrangements are to be submitted for approval.

2. **Air, Overflow, and Sounding Pipes.**—(*a*) Each oil fuel compartment is to be fitted with one or more air pipes, the discharge ends of which are to be led to the open air in a situation where no danger will be incurred from the issuing oil vapour when the compartment is being filled, and each is to be furnished with a wire gauze diaphragm which can readily be removed for cleaning or renewal.

Where no overflow pipes are fitted, the sectional area of the air pipes to each compartment is to be not less than that of its filling pipe.

(*b*) Where overflow pipes are fitted to any oil fuel compartments, they are to have not less sectional area than the filling pipes, and are to be so arranged that no oil or vapour issuing from them will be a source of danger.

(*c*) Each oil fuel compartment is to be provided with a suitable means for ascertaining the oil level therein, either by sounding pipes or by approved indicating apparatus. If sounding pipes are fitted, they are to be led to the weather deck, or to an accessible position on a deck above the load water line; short sounding pipes may be approved in the shaft tunnels or machinery spaces, provided they are fitted to close automatically or with lock-up screw caps of approved type. Doubling plates are to be fitted under all sounding pipes.

(*d*) Round gauge glasses are not to be fitted either to the oil storage, settling, or service tanks, but suitably protected gauges of approved design, having flat glasses of substantial thickness, and self-closing cocks or valves, may be allowed on settling and service tanks.

3. **Boiler Insulation.**—(*a*) The boilers are to be suitably lagged. The clearance spaces between the boilers and tops of the double bottom tanks, and between the boilers and the sides of the storage tanks or bunkers in which oil fuel is carried, are to be adequate for the free circulation of air necessary to keep the temperature of the stored oil well below the flash point. If 12" recommended but bottoms of boilers be lagged.

(*b*) Where water tube boilers are installed, it is recommended that there should be a space of at least two feet six inches between the tank top and the underside of the pans forming the bottom of the combustion spaces.

(*c*) Funnel dampers, if fitted, must be provided with a suitable device whereby they may be securely locked in the fully open position. Funnel dampers must not be fitted on ships equipped for burning oil fuel only.

(*d*) Smoke box doors are to be shielded and well fitting, and the uptake joints made airtight.

4. **Pressure Pumps.**—The pressure pumps for the oil fuel burning system are to be entirely separate from the feed, bilge, and ballast pumps and connections. In every ship there are to be not fewer than two units (a unit comprising pressure pump, filters, and heater). All pumps used in connection with oil fuel are to be provided with efficient escape valves, which are to be in close circuit, *i.e.*, discharging to the suction side of the pumps.

5. **Oil Pipes and Fittings.**—(*a*) The oil pressure pipes conveying heated oil are to be of solid drawn steel, and placed in sight above the platforms in well-lighted parts of the stokehold or engine-room. The coupling flanges are to be machined so that they are practically metal to metal, any jointing material used being the very thinnest possible, and impervious to oil heated to 250° F. The scantlings of the flanges are to be made suitable for at least 200 lbs. per square inch working pressure, or the pressure to which the relief valves are loaded, whichever is the greater.

The pipes, heaters, and their fittings are to be tested after jointing to at least 400 lbs. per square inch, or to double the working pressure, whichever is the greater.

(*b*) Other oil fuel pipes, and all bilge or water pipes passing through oil storage tanks are to be made of iron or steel. The coupling flanges are to be machined and the jointing material used is to be impervious to oil. The scantlings of the flanges are to be made suitable for not less than 100 lbs. per square inch working pressure, and, after jointing, the oil fuel pipes within the engine and boiler spaces are to be tested to 30 lbs. per square inch. All such pipes within the engine and boiler spaces are to be led sufficiently high above the inner bottom to facilitate inspection and repairs.

6. **Valves and Cocks.**—(*a*) All oil fuel suction pipes are to be fitted with valves or cocks at the bulkheads where they enter the machinery space.

(*b*) In the case of all oil fuel storage, settling and daily service tanks, other than double bottom tanks, the suction valves or cocks are to be secured to the tanks, and so geared that they may be shut off from positions which will always be accessible in the event of fire taking place in the compartment in which they are situated. In the case of peak tanks, these valves or cocks are to be fitted on the tank side of the peak bulkheads.

(*c*) All valves or cocks in the machinery space connected with oil fuel installations are to be capable of being controlled from above the engine and boiler room platforms.

(*d*) Where the filling pipes to settling and service tanks are not connected to the tanks near the top, they are to be provided with valves or cocks, controlled as in the case of the suction valves or cocks on these tanks, or else with non-return valves, secured to the tanks.

(*e*) Valves or cocks are to be interposed between the pumps and the suction pipes in order that the latter may be shut off when the pumps are opened out for overhauling.

(*f*) Open drains for removing the water from the oil storage, settling or service tanks are not allowed unless the drain cock or drain valve be of self-closing type.

(*g*) All valves in connection with the oil fuel apparatus are to be so constructed as to prevent the possibility of any cover being slacked back or loosened when operating the valves.

7. **Control of Pumps.**—The motive power of all oil fuel pressure pumps, and the steam supply for the fire extinguishing apparatus, are to be capable of being controlled from a position which will always be accessible in the event of fire taking place in the compartment in which they are situated as well as from the compartment itself.

8. **Compartments for Storage of Fresh Water.**—The pipes in connection with compartments used for storing fresh water either for boilers or for drinking are to be separate and distinct from any pipes that may be used for oil or oily water.

9. **Tanks for Carrying Oil or Water Ballast Alternatively.**—(*a*) Where it is intended to carry oil fuel and water ballast in the same compartments alternatively, the valves or cocks connecting the suction pipes of these compartments with the ballast donkey pump, and those connecting them with the oil fuel transfer pump, are to be so arranged that the oil may be pumped from any one compartment by the oil fuel pump at the same time as the ballast donkey pump is being used on any other compartment. Where settling or service tanks are fitted of large capacity so that they do not require frequent replenishment, the above requirement may be dispensed with.

(*b*) In the case of deep tanks which can be used for oil fuel, water ballast or cargo, provision is to be made for blank flanging the oil fuel and water ballast filling and suction pipes when the tanks are being used for cargo, and for blank flanging the bilge suction pipes when the tanks are being used for oil fuel or for water ballast.

10. **Steam Heating Coils.**—(*a*) Where steam is used for heating the oil fuel, either in the bunkers, tanks, or heaters, the exhaust drains are to discharge the water of condensation into an observation tank where it can be seen whether or not it is free from oil.

(*b*) The steam heating pipes in contact with the oil fuel are to be of wrought iron or steel, and are to be tested, after being fitted on board, to twice their working pressure.

11. **Ventilation.**—The spaces in which the oil fuel burning appliances and the oil fuel settling and service tanks are fitted are to be well ventilated and easy of access.

12. **General.**—(*a*) No wood fittings or bearers are to be fitted in the boiler rooms, or in the compartments containing the settling tanks.

(*b*) Savealls are to be fitted at the furnace mouths to intercept oil escaping from the burners.

(*c*) Bilge suction pipes of lead are not permissible in engine or boiler spaces where settling tanks or oil fuel appliances are situated.

(*d*) Water service pipes and hoses are to be fitted so that the stokehold plates and tank top under the boilers can at any time be flushed with sea water, and, in addition, steam from the auxiliary range of piping is to be led to pipes perforated for the emission of steam into the lower parts of the boiler room.

(*e*) The pumping arrangements of the oil fuel installations are to be submitted for approval.

OIL CARRIED AS CARGO.

Section 20A. 1. **General.**—Where it is desired that a special notation be made in the Register Book indicating that a deep tank or a peak tank is considered to be structurally suitable for the carriage of oil as cargo, the following requirements are to be complied with.

2. **Flash Point.**—The flash point of the oil to be carried is not to be lower than 150° F.

3. **Scantlings and Riveting.**—(*a*) The scantlings and riveting are to be as required for deep tanks carrying oil fuel.

(*b*) The arrangements for fittings and control as set forth in **Section 20** are also to be complied with as far as they are applicable.

4. **Notation.**—Where the requirements referred to above are complied with, a notation will be made in the Register Book, "Fitted for carrying oil (date) F.P. above 150° F. in Deep and/or Peak Tank" as the case may be.

5. **Loading Test.**—Before a cargo of oil is loaded the tank should be tested under water pressure and examined for cleanliness to ensure that it is in a proper condition to receive the oil cargo.

NON-WATERTIGHT BULKHEADS.

Section 21. 1. **Middle Line Bulkheads.**—(*a*) The thickness of the plating is to be ·30 inch in the holds, and ·26 inch in the 'tween decks. The bulkhead is to be attached at the top and bottom by single angle bars ·10 inch thicker than the bulkhead plating.

(*b*) The vertical stiffeners are to be of the sizes given in **Table 35**, and may be fitted two frame spaces apart provided the frame spacing does not exceed 30 inches. Where the frame spacing is greater than 30 inches the stiffeners are to be fitted on every frame and the scantlings may be correspondingly reduced.

Where quarter pillars are fitted the stiffeners may be reduced in strength by 20 per cent.

(*c*) The stiffeners at the ends of the hatchways are to be bracketed at top and bottom, and where reinforced hatchway end beams are fitted, these stiffeners are to be doubled or equivalent arrangements provided. The remainder of the stiffeners are to be riveted to the beams and are to be attached at the bottom by double riveted lugs.

2. **Bunker Bulkheads.**—(*a*) The thickness of the plating and the scantlings of the bars at top and bottom of longitudinal vertical bunker bulkheads are to be as required for the middle line bulkheads except that the lowest strake, which is to extend at least 24 inches above the level of the stokehold floor, is to be ·36 inch in thickness.

(*b*) The vertical stiffeners of longitudinal bulkheads which act as supports to the deck are to be of the sizes given in **Table 35.**

(*c*) Where longitudinal bulkheads do not act as supports to the deck the stiffeners are to be of the sizes given in **Table 35.**

(*d*) The stiffeners are to be fitted two frame spaces apart provided the frame spacing does not exceed 30 inches. Where the frame spacing is greater than 30 inches the stiffeners are to be fitted on every frame, and the scantlings may be correspondingly reduced.

(*e*) The plating of transverse bunker bulkheads is to be as required for longitudinal bulkheads, and the stiffeners, which are to be spaced 36 inches apart, are to be in accordance with the requirements of **Table 35.**

(*f*) Where sloping bunker casings are fitted, the scantlings of the stiffeners are to be suitably increased, and the stiffeners are to be additionally supported from the deck beams by angle stays, attached by brackets to the deck beams and the casing stiffeners.

DETACHED SUPERSTRUCTURES.

Section 22. 1. **"Short" Deck Superstructures.**—(*a*) The scantlings of poops, forecastles and "short" bridges (*i.e.*, bridges of which the length does not exceed 15 per cent of the length of the vessel) are to be in accordance with the requirements of **Table 25.**

(*b*) All vessels are to have forecastles except in cases in which the scantlings of the vessel do not exceed the requirements for complete superstructure vessels. Where the conditions of service may necessitate the omission of the forecastle, additional sheer is to be provided as may be required by the Committee.

(*c*) Where steel decks are fitted on poops, short bridges or forecastles, the thickness is not to be less than in the following Table, except that steel decks which are sheathed need not exceed the thickness given in **Table 25** for stringers and tie-plates.

	Beams at every frame.	Beams at alternate frames.
	Inches.	Inches.
Sheathed ...	·26	·30
Unsheathed ...	·30	·34

The thickness of plating given for forecastles in **Table 25** is applicable to unsheathed decks with beams fitted at every frame. Where the decks are sheathed a reduction of ·06 inch may be permitted in the thickness of the plating, provided a minimum of ·26 inch is maintained.

(*d*) The seams of the side and deck plating and the butts of the side plating, stringer plates, deck plating, and tieplates may be single riveted.

2. **"Long" Bridges.**—(*a*) Where the length of the bridge exceeds 15 per cent of the length of the vessel, the scantlings are to be as required by **Tables 22** and **23.**

(*b*) The riveting of the butts and seams of the deck plating and of the side plating is to be as required by **Table 39.** The riveting of the seams of bridge side plating need not exceed the riveting of the side shell plating but the seams are in every case to be double riveted for four frame spaces at the ends.

3. **Framing.**—Partial bulkheads are to be fitted in bridges below large deckhouses, which bulkheads are to be in continuation of watertight bulkheads fitted below. Partial bulkheads may also be required to be fitted at other places.

4. **Strengthening at ends of Poops, Forecastles and Bridges.**—(*a*) **Bridges.** At each end of a bridge the upper deck sheerstrake and the upper deck stringer plate are to be increased in thickness by 50 per cent in the case of long bridges and 30 per cent at short bridges. In way of a long bridge the sheerstrake, strake below and the upper deck plating, as fitted in the wells, are to be extended within the ends of the bridge for a distance equal to one-third the breadth of the vessel. The bridge side plating is to be extended beyond the ends of the bridge and is to be supported by plate webs spaced not more than five feet from the ends of the bridge. The bulwark rail is to be connected to the bridge end bulkheads by substantial bracket plates, and similar bracket plates are to be fitted on the inner side of the bulkhead.

(*b*) **Poops and Forecastles.** The additional strengthening prescribed above is to be fitted at the fore end of a poop or at the after end of a forecastle, wherever the length exceeds 25 per cent of the length of the vessel.

5. **Poop and Bridge Bulkheads.**—(*a*) Bulkheads at the fore end of bridges, long poops, and poops covering deck openings are to have a thickness of ·30 inch for vessels of 200 feet in length, and ·40 inch for vessels over 330 feet in length, with coaming plates ·04 of an inch thicker than the plating.

(*b*) The bulkheads are to be stiffened with bulb angles of the sizes given in the following Table :—

Breadth of Ship.	Size of Bulb Angle Stiffeners.	Number of rivets in Lugs.	Breadth of Ship.	Size of Bulb Angle Stiffeners.	Number of rivets in Lugs.
Feet.	Inches.		Feet.	Inches.	
24	$5\frac{1}{2} \times 3 \times \cdot 30$	3	46	$8 \times 3 \times \cdot 42$	5
30	$6\frac{1}{2} \times 3 \times \cdot 34$	4	50	$8\frac{1}{2} \times 3 \times \cdot 50$	5
36	$7\frac{1}{2} \times 3 \times \cdot 36$	4	54	$9 \times 3 \times \cdot 50$	5
42	$7\frac{1}{2} \times 3 \times \cdot 40$	4	58 and above	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	5

The stiffeners are to be spaced 30 inches apart, and efficiently connected to the deck plating at top and bottom by lugs having the number of rivets in each flange specified in the Table.

(*c*) Bulkheads at the fore end of bridges not covering deck openings, and poops not protected by bridges, are to have plating of the thickness required by **paragraph** (*a*), but the stiffeners may be 10 per cent less in depth than given in **paragraph** (*b*).

(*d*) At the fore end of poops which are protected by bridges and which do not cover engine and boiler or other deck openings, the thickness of the bulkhead plating and coaming need not exceed ·36 and ·40 inch respectively, and the bulkheads may be stiffened with plain angles of the size given in the following Table, spaced 30 inches apart, and connected to the deck plating at top and bottom by lugs having the number of rivets in each flange specified in the Table :—

Breadth of Ship.	Size of Angle Stiffeners.	Number of rivets in Lugs.	Breadth of Ship.	Size of Angle Stiffeners.	Number of rivets in Lugs.
Feet.	Inches.		Feet.	Inches.	
24	$3\frac{1}{2} \times 3 \times \cdot 28$	2	46	$5\frac{1}{2} \times 3 \times \cdot 36$	3
30	$4 \times 3 \times \cdot 30$	2	50	$6 \times 3 \times \cdot 38$	3
36	$4\frac{1}{2} \times 3 \times \cdot 32$	3	54	$6\frac{1}{2} \times 3 \times \cdot 40$	4
42	$5 \times 3 \times \cdot 34$	3	58 and above	$7 \times 3 \times \cdot 42$	4

6. **Deckhouses.**—(*a*) All deckhouses on upper decks, or on decks of superstructures, are to be of sufficient strength and, where the length of the deckhouse exceeds 10 per cent of the length of the vessel, plans showing the scantlings and arrangements are to be submitted for approval.

(*b*) The sides and ends of large deckhouses are to be supported by partial bulkheads and web frames, together with intermediate vertical stiffeners. It is recommended that the spacing of the partial bulkheads, or webs, is not to exceed 30 feet, and, where possible, these are to be fitted above the structural bulkheads of the vessel.

Web frames should also be fitted, where possible, at the sides of large doors.

(*c*) Care is to be taken, as far as possible, to minimise the effects of all discontinuities in the structure of deckhouses and it is recommended that continuous coamings should be fitted below and above doors and other openings, and that the corners of all openings cut in the sides of deckhouses should be well rounded.

(*d*) The tops of the deckhouses are to be efficiently supported by beams of suitable scantlings, and it is recommended that beams should, as far as possible, be fitted in line with the side stiffeners and be connected to them by bracket knees. In all vessels exceeding 300 feet in length where the top of the house forms the weather deck above passenger accommodation the beams are to be completely plated over the accommodation.

(*e*) The deckhouse sides are to be additionally stiffened in way of boats and the decks strengthened in way of the davits.

RAISED QUARTER DECKS.

Section 23. 1. **Scantlings.**—(*a*) In vessels of the raised quarter deck type the scantling numerals and moulded depth are to be taken to the upper deck.

(*b*) The scantlings and arrangements of the side framing in way of the raised quarter deck are to be determined by the moulded depth of the vessel taken to the upper deck in association with the framing depth (d) taken in way of the raised quarter deck.

(*c*) The scantlings of the raised quarter deck stringer and plating, sheerstrake and strake below, are to be as required by the Tables for a vessel having a longitudinal numeral calculated as in **paragraph** (*a*) in association with a proportion of length to depth taken to the raised quarter

deck, but no addition need be made to the thickness of the deck stringer and plating on account of proportion of length of vessel covered by superstructures.

2. **Break Bulkhead.**—The front or break bulkhead of the raised quarter deck is to have the thickness of the plating required for bridge front bulkheads, and is to be efficiently stiffened.

3. **Strengthening at Break.**—(*a*) The upper deck stringer plate is to extend abaft the break about four frame spaces, and the raised quarter deck stringer plate is to be extended about three frame spaces forward of the break; the bridge stringer is also to be extended abaft the break.

(*b*) In vessels which require a steel deck or part steel deck, the upper deck plating is to scarph the raised quarter deck for a length of two to three frame spaces according to the size and proportions of the vessel, and the upper deck stringer plate is to extend two or three frame spaces abaft the deck plating.

(*c*) Sufficient diaphragm plates are to be fitted, of the thickness of the break bulkhead plating, to connect the two decks. They are to be attached to the decks and bulkhead by double angles, and are to be stiffened by an angle on the after edge and vertical stiffeners where necessary.

(*d*) The upper deck sheerstrake is to be increased in thickness and is to be extended for a reasonable distance abaft the break. In the case of a raised quarter deck connected to a long bridge the raised quarter deck sheerstrake is to be increased in thickness, and the bulwark plates of the raised quarter deck adjoining the bridge side plating are also to be increased in thickness.

CRUISER STERNS.

Section 24. 1. **Length.**—Where vessels have cruiser sterns, the length (L) of the vessel is to be measured in the manner required by **Section 3, clause 1.**

2. **Framing.**—(*a*) The frames abaft the after perpendicular are to be spaced 24 inches apart, and are to be of the size required for bulb angle frames in peaks, and are to extend to the strength deck.

(*b*) Floor plates are to be of a reasonable depth, depending upon the form of the vessel, and are to be supported at the centre line by an intercostal girder.

(*c*) Additional stiffening in the form of web frames and longitudinal girders is to be provided as may be necessary.

3. **Beams.**—Beams are to have the scantlings required by the Rules for the respective decks.

4. **Plating.**—The plating round the cruiser stern is to be of the thickness required by **Tables 18** and **19** for side shell plating at ends. The riveting of the landing edges and butts is to be the same as that of the corresponding strakes of shell plating at ends, but the edges and butts are not to be less than double riveted up to the strength deck.

5. **Pillaring.**—Pillaring arrangements are to be fitted to the satisfaction of the Surveyors.

HATCHWAYS AND DECK OPENINGS.

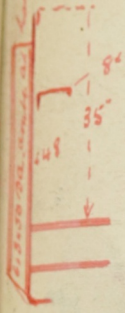
Section 25. 1. **Height of Coamings.** — The minimum height of coamings above decks is to be as follows:—

On upper decks, except as qualified below, and on raised quarter decks, where exposed to weather		24	inches.
On upper decks of vessels whose draught does not exceed that which could be assigned as a Complete Superstructure vessel, and on decks of superstructures where exposed to the weather ...	When within $\frac{1}{4}$ of the vessel's length from the stem ...	24	„
	When aft of the above ...	18	„
On decks inside superstructures the openings in the latter having no means of closing		18	„
On decks inside superstructures the openings in the latter being closed by strong hinged wood doors or wooden shifting boards fitted in channels or equivalent		9	„

On decks below the upper deck, or within an intact superstructure, the coaming plates need not extend above the deck, but in such cases an angle coaming is to be fitted round these hatchways; all openings in decks are required to be framed.

2. **Thickness of Coamings.**—(*a*) **In hatchways on the upper deck or on superstructure decks** where exposed to the weather, the side and end coamings are to be not less than ·44 inch in thickness in vessels exceeding 200 feet in length. For vessels 100 feet long, the coamings are to be ·36 inch in thickness, and for vessels of intermediate length the thickness may be obtained by interpolation.

(*b*) **In hatchways below the upper deck, or within an intact superstructure,** the side and end coamings are not to be less than ·40 inch in thickness.



3. **Construction of Coamings.**—(*a*) Angles connecting coamings and deck plating are to be of the thickness of the coamings to which they are attached, and where a wood deck is fitted, the vertical flange is to extend half-an-inch above such deck.

The angles connecting the side and end coamings are to be of the thickness of the coamings.

(*b*) Hatchway coamings, which are required by **clause 1** of this Section to extend above the deck, are to be caulked and made watertight, and the angles connecting these hatchway coamings to the deck plating are to be turned or welded at the corners.

(*c*) The side coamings of all hatchways are to extend to the lower edge of the beams.

(*d*) Hatchway side coamings, which are 24 inches or more in height above the deck, and which are above 10 feet in length, are to be stiffened by horizontal bulb angles, not less than 7 inches in depth, fitted near their upper edges.

Where hatchways exceed 10 feet in breadth, the end coamings are to be similarly strengthened, or be made equivalent thereto, unless the end coamings are adequately protected by the deck erections.

Where the length or the breadth of the hatchway exceeds 15 feet, additional support is to be afforded by fitting brackets or stays from the bulb angle to the deck at intervals of not more than 10 feet. Where the coamings are 36 inches in height and above, plans shewing the construction are to be submitted for approval.

(*e*) Where the pillars abreast the hatchways are spaced more than 4 frame spaces apart, or where the line of pillars at sides of hatchways is more than 18 inches from the coamings, the coamings will require to be made sufficiently strong as a girder to support the deck load, and plans of such cases are to be submitted for approval. (See **Section 16**).

4. **Hatchway Beams.**—(*a*) Hatchway beams and fore and afters are to be of the sizes given in **Table 36A**, and are to be so spaced that the unsupported length of the hatch covers does not exceed 4 feet 6 inches in all hatchways, except in the following cases—(1) hatchways on weather decks where the height of the coaming permitted by **clause 1** is 18 inches, and (2) hatchways in spaces fitted exclusively for the accommodation of passengers—where they may be of the sizes given in **Table 36B**, and so spaced that the unsupported length of hatch covers does not exceed 5 feet 6 inches.

In cases in which it is desired to adopt a wider spacing of beams, the thickness of the covers is to be suitably increased.

In no case are hatchway beams to be more than 10 feet apart.

(*b*) Where the height of 'tween decks exceeds 8 feet 6 inches the scantlings of the hatchway beams and covers are to be suitably increased.

(*c*) The web plate beams are to be stiffened at their upper and lower edges by double angles, as required by **Tables A** and **B**, the angles at the upper edges are to extend to the extreme ends in all cases, and are not to be recessed to form bearers where fore and afters are fitted.

The ends of the web plates are to be flushed up on each side by doubling plates, having the same thickness as the angle mountings, and at least 7 inches wide.

Where no fore and afters are fitted, the alternate web plates are to extend to the top of the wood hatches.

(*d*) **Steel fore and afters** are to have angle mountings at the upper edges, as required by **Table 36**, and these mountings are to extend to the extreme ends in all cases.

Bearing pieces of heavy angle bar are to be fitted on the lower edge in way of each hatchway beam which they cross.

(*e*) **Wood fore and afters** are to be of pitch pine, or other wood of not less hardness and strength, free from defects, and are to be cut from the solid wood. Steel shoes, at least $7 \times \cdot 5$ inches are to be fitted at each end of wood fore and afters, and plate bearing pieces, at least $9 \times \cdot 5$ inches, in way of each hatchway beam which they cross.

5. **Carriers.**—(*a*) All hatchway beams and fore and afters are to be efficiently supported at their ends by steel carriers, with a length of bearing of not less than 3 inches; they are to be fitted close to the sides and throat of the hatchway beams and fore and afters. Where carriers are of angle bars they are to be not less than ·50 inch in thickness, and one bar of each carrier is to extend at least to the level of the deck.

(*b*) Where the carriers adopted are of a form such as will not permit them to be extended to the deck, the thickness of the hatchway side coaming must be increased.

(*c*) Where fore and afters extend across hatchway beams, strong lugs are to be fitted on the beam to keep the fore and afters in position.

(*d*) The bottoms of all carriers are to be solid, or are to be efficiently secured by not less than two $\frac{7}{8}$ inch rivets.

6. **Hatch Covers.**—(*a*) Hatch covers are to be fitted to the hatchways in way of all laid decks. They are to be solid and not less than $2\frac{1}{2}$ inches in thickness, except those on non-exposed hatchways, which may be of grating of sufficient strength.

(*b*) Where it is desired to adopt a wider spacing of beams than provided in **clause 4**, the thickness of the covers is to be increased, and is not to be less than 3 inches where the beam spacing is 6 feet, in the case of hatchways whose scantlings are determined under **Table A.**

(*c*) Hatch covers may be dispensed with at decks below the upper deck or within an intact superstructure, as defined in the last paragraph of **clause 1**, if desired by the owners, and, in any case where they are so dispensed with, the Certificate of Classification will be suitably endorsed, and a corresponding notation made in the Register Book.

7. Hatch Rests.—Hatch rests are to be at least 2½ inches wide, where fore and afters are fitted, and, where necessary, the hatch rests are to be bevelled, so as to provide bearing surface of not less than that width. Where no fore and afters are fitted, the hatch rests on the end coamings are to be at least 3 inches wide.

8. Cleats, Battens, and Tarpaulins.—Cleats, not more than 2 feet apart centre to centre, are to be fitted to the coamings of all hatchways on or above the upper decks, unless such hatchways are within an intact superstructure; the end cleats are to be placed not more than 6 inches from the hatchway corners. They are to be of strong section, at least 2½ inches wide, and are to be attached by not less than two rivets.

The battens, wedges, and tarpaulins, are to be efficient for their purpose and in good condition.

9. Bunker Hatchways.—The minimum heights of coamings of these hatchways are to be in accordance with **clause 1**, and covers, beams, and battening down arrangements as effective as those required for cargo hatchways are to be fitted. If the deck beams in way of these openings are cut, fore and aft coaming plates are to be fitted to take the beam ends.

10. Flush Bunker Scuttles.—Flush bunker scuttles may be fitted in the following positions:—

(*a*) On bridge decks, poop decks, or on upper decks of complete superstructure vessels having tonnage openings.

(*b*) In positions which are always accessible on decks inside superstructures where the openings in the latter are closed with efficient closing appliances.

The scuttles are to be of iron or steel, of substantial construction, and are to have screw or bayonet joints. Where the scuttles are not secured to the frames by hinges, a permanent chain attachment is to be provided.

11. Escape Scuttles.—(*a*) Where escape scuttles are fitted on the weather decks, strong coamings having a minimum height above the deck, as required by **clause 1**, are to be fitted, and are otherwise to comply generally with the requirements of this Section.

(*b*) Where escape scuttles are fitted on decks inside superstructures, the openings in the latter being closed by strong hinged wood doors or wood shifting boards fitted in channels or equivalent, the scuttles are to be provided with either

1. Strong coamings 9 inches in height with weathertight wood covers,

or

2. Angle coamings with hinged watertight steel covers secured by strong backs or closely spaced bolts and nuts.

(*c*) Where escape scuttles are fitted in the 'tween decks and on decks within intact superstructures, the openings are to be provided with angle coamings and wood covers are to be fitted. This requirement may be modified to suit special conditions of trade on application being made to the Committee by the Owners.

12. Trunked Hatchways.—Where hatchways are trunked through one or more 'tween decks, and the hatchway beams and covers are dispensed with at the intermediate decks, the hatchway beams, fore and afters, coamings and deck immediately below the trunk are to be adequately strengthened, and in such cases plans are to be submitted for approval.

Where the trunkways are intended to take the place of 'tween deck pillars in way of the hatches, they are to be of steel and are to be efficiently stiffened.

13. Companions.—Companions on exposed decks should be of steel and be securely riveted to the deck.

14. Mast Holes.—In way of mast wedging, where iron or steel decks are not fitted, plates are to be riveted to the beams, of not less thickness than is required for stringer plate amidships, and of not less width than three times the diameter of the mast.

VENTILATORS TO CARGO SPACES.

Section 26. **1. Number and Size.**—It is recommended that ventilators sufficient in number and size be efficiently fitted to weather decks of all vessels.

2. Ventilator Coamings.—(*a*) Where exposed to the weather the minimum height of coamings is to be 36 inches on upper decks, except as qualified below, and on raised quarter decks. On upper decks of vessels whose draught does not exceed that which could be assigned as a Complete Superstructure vessel, and on decks of superstructures, the minimum height of coaming is to be 30 inches except on superstructure decks within one-fourth of the vessel's length from stem where the height is to be 36 inches.

If ventilator coamings are fitted of a greater height than 36 inches and are not efficiently supported by adjacent structures, they are to be strongly stayed or bracketed to the deck.

(*b*) The scantlings of the coamings and their attachment to the deck are to be in accordance with the following Tables :—

VENTILATOR COAMINGS.

Internal Diameter of Ventilator Coaming.	Coaming Plate.	Deck Bar.
Inches.	Inch.	Inches.
6 and not exceeding 8	·30	3 × 3 × ·34
Above 8 „ „ 11	·32	3 × 3 × ·36
„ 11 „ „ 13	·34	$3\frac{1}{2} \times 3\frac{1}{2} \times ·38$
„ 13 „ „ 15	·36	$3\frac{1}{2} \times 3\frac{1}{2} \times ·40$
„ 15 „ „ 17	·38	$3\frac{1}{2} \times 3\frac{1}{2} \times ·42$
„ 17	·40	$3\frac{1}{2} \times 3\frac{1}{2} \times ·44$

ATTACHMENT TO DECK.

Internal Dia. of Ventilator Coaming.	Dia. of Rivet.	No. of Rivets in vertical flange.	No. of Rivets in horizontal flange.
Inches.	Inch.		
12	$\frac{3}{4}$	11	15
13	$\frac{3}{4}$	12	16
14	$\frac{3}{4}$	13	18
15	$\frac{3}{4}$	14	19
16	$\frac{7}{8}$	14	19
17	$\frac{7}{8}$	14	20
18	$\frac{7}{8}$	15	21
19	$\frac{7}{8}$	16	22
20	$\frac{7}{8}$	17	23

In ventilators less than 12 inches in diameter the rivets are to be $\frac{3}{4}$ inch diameter, spaced 4 diameters, centre to centre.

(*c*) A steel ring is to be riveted to the outside of the coaming to provide a proper bearing for the cowl, and the housing is to be not less than 15 inches.

(*d*) On unsheathed decks the coaming is to be riveted to the deck plating.

(*e*) In cases where a steel deck is sheathed with wood the coaming is to be riveted direct to the steel deck, and the vertical flange of the bar is to extend at least half an inch above the wood sheathing.

3. **Stiffening of Deck below Ventilators.**—(*a*) Where the thickness of the deck plating is less than ·40 inch, a doubling plate of a length and breadth not less than twice the diameter of the ventilator, and not less than ·30 inch in thickness is to be fitted, or other suitable stiffening is to be fitted in lieu of this local doubling. Where there is no steel deck fitted, a plate of breadth equal to twice the diameter of the ventilator, and ·40 inch thick is to be riveted to the deck beams to take the coaming angle.

(*b*) Where beams are fitted on alternate frames and the ventilator is over 12 inches in diameter, an efficient fore and aft angle bar strongly connected to the beams is to be fitted on each side of the ventilator coaming.

4. **Covers.**—All ventilator coamings are to be provided with strong plugs and canvas covers or equally efficient appliances for closing the openings when the cowls are unshipped.

5. **Mushroom and Gooseneck.**—Such ventilators when fitted to accommodation spaces are to be substantially constructed and efficiently bolted to the deck plating.

6. **Scuttles in Topsides.**—When scuttles are fitted in the topsides of vessels below the upper deck, strong covers, efficiently fitted, are to be provided to the approval of the Surveyors.

7. **Mechanical Ventilation.** — Where a system of mechanical ventilation is adopted, sketches showing the construction of the tanks, fan casings and so forth, on the weather deck are to be submitted for approval.

8. **Alternative arrangements.**—Should the owners desire it, other arrangements proportionate to those prescribed in this Section may be adopted.

ENGINE AND BOILER SPACE.

Section 27. 1. **Engine and Boiler Bearers.**—(*a*) Engine and boiler bearers are to be of substantial construction and are to be efficiently supported by brackets, both longitudinally and transversely.

(*b*) Where engines are bolted direct to the inner bottom, the thickness of the plating under the engines is to be suitably increased.

(*c*) In single bottom vessels the floors in the engine space are to be increased in depth.

(*d*) In all vessels additional fore and aft girders are to be fitted in way of the engine seating and thrust block seating and are to be attached to the shell.

(*e*) Where it is intended to fit engines of special type or of greater power than in ordinary cargo carrying steamers, the engine seating is to be proportionately increased, and plans are to be submitted for approval.

2. **Additional Strengthening in Machinery Space.**—Additional transverse strengthening by means of web frames and strong beams, or otherwise, is to be provided in the machinery space.

3. **Clearance between Bulkheads and Boilers.**—Coal bunker and hold bulkheads are to be kept well clear of boilers and uptakes.

Where the boiler room bulkhead is recessed for a boiler, the recess is to be of a size sufficient to provide space all round the boiler for proper access.

The roof of the recess is not to be less than 4 feet clear of the top of the boiler, the space between the bunker plating and the uptake is not to be less than 18 inches, and a baffle plate is to be fixed between the uptake and the bulkhead, or other efficient means are to be provided.

Uptakes and flat surfaces of boilers are not to be less than 18 inches, and cylindrical shells of boilers are not to be less than 9 inches, from coal bunker and hold bulkheads.

4. **Protection of Deck under Donkey Boilers.**—Where donkey boilers are placed on the decks of vessels the deck underneath is to be increased ·10 inch in thickness, and is to be protected by being covered with firebrick or cement not less than 2 inches in thickness. A similar increase in thickness and means of protection are to be fitted to decks on which fires may be drawn from any donkey boiler.

ENGINE AND BOILER OPENINGS.

Section 28. 1. **Extent and Construction of Machinery Casings.**—(*a*) Engine and boiler openings on the weather deck are to be protected by properly framed casings of substantial construction.

(*b*) The minimum height of casings on upper decks, except as qualified below, is to be 6 feet in vessels not exceeding 270 feet in length, and 7 feet 6 inches in vessels 400 feet in length and above.

(*c*) On upper decks of vessels whose draught does not exceed that which could be assigned as a Complete Superstructure vessel, and on decks of superstructures where exposed to the weather, the height of the casing is not to be less than 2 feet 6 inches.

(*d*) The engine and boiler openings should be made as small as practicable, and as many cross ties as possible are to be fitted at each deck. The tops of the side casings are to be efficiently connected by beams and plating.

(*e*) In the cases of vessels referred to in **paragraph** (*b*) above, the thickness of the casings is not to be less than ·26 inch for vessels 100 feet in length; ·30 inch in vessels 200 feet in length; and ·34 inch in vessels 300 feet and above in length; for vessels included in **paragraph** (*c*) above, the thickness of the casings is to be ·26 inch in vessels up to 200 feet in length, and ·30 inch in vessels 300 feet and above in length; the coaming plates are to be ·04 inch thicker than the plating.

(*f*) For casings 7 feet 6 inches in height, the stiffeners are to be spaced 30 inches apart, and for the vessels referred to in **paragraph** (*b*) are to be $3 \times 2\frac{1}{2} \times \cdot 26$ inches angle in vessels 100 feet in length; $4 \times 3 \times \cdot 28$ inches angle in vessels 200 feet in length; and $4\frac{1}{2} \times 3 \times \cdot 30$ inches angle in vessels 300 feet and above in length; for all vessels included in **paragraph** (*c*) the stiffeners are to be $3 \times 3 \times \cdot 30$ inches angle.

2. **Trunk Casings.**—Where the engine and boiler openings in the 'tween decks are enclosed by trunk casings they are to have ·26 inch plating and ·30 inch coamings and are to be suitably stiffened. Where the casings form the boundary of coal bunkers, the requirements of **Section 21** are to be complied with.

3. **Skylights and Gratings.**—Engine room skylights are to be substantially constructed, and are to be securely bolted or riveted to the coamings.

Grating openings over stokehold are to be protected by hinged plate covers.

FREEING PORTS AND SCUPPERS.

Section 29. 1. **Freeing Ports.**—(*a*) Where weather decks are enclosed by bulwarks, ample provision is to be made for rapidly freeing the decks from large quantities of water.

(*b*) The area of the openings provided for this purpose in the bulwark at the upper deck of full scantling vessels, should be irrespective of the height of the bulwarks, in accordance with the following Table :—

Length of Well.	Area on each Side.	Length of Well.	Area on each Side.
Feet.	Square Feet.	Feet.	Square Feet.
5	2	40	$10\frac{1}{2}$
10	4	50	$11\frac{1}{2}$
15	$5\frac{3}{4}$	60	$12\frac{1}{2}$
20	$8\frac{1}{2}$	70	14
30	$9\frac{1}{2}$	80	16

On superstructures of standard height the area should be one half of that required in the Table.

(*c*) All such openings in bulwarks are to be protected by rails or bars spaced not more than 9 inches apart. If hinged doors are also fitted over the openings, their hinges are to have brass pins and there are not to be any fittings for keeping the doors closed.

2. **Scuppers.**—(*a*) Scuppers sufficient in number and size to provide thoroughly effective drainage are to be fitted in all decks.

(*b*) Where the weather deck stringer angle is cut in way of scuppers, a compensating bar is to be fitted below the stringer plate.

(*c*) Scupper pipes from permanently enclosed 'tween decks are to be led to the bilges.

Scupper pipes from superstructures which are permanently closed at the forward end, but which have temporary closing appliances at the after end, are to be fitted to drain overboard, with the exception of the scuppers within the range of the machinery space, which may be led and drained to the bilges of the machinery space. Scuppers which drain overboard are to be fitted with storm valves, or some other approved appliances.

Scupper pipes from superstructures which have temporary closing appliances at the forward end are to be led overboard and fitted with storm valves or some other approved appliances.

3. **Storm Valves.**—Where soil or scupper pipes are attached to the outside plating below or near the load water line, non-return storm valves are to be fitted in substantial metal castings other than cast iron. The lower length of pipe is to be of galvanised iron or steel of substantial thickness, not less than standard steam pipe quality.

4. **Protection of Pipes in Holds and Bunkers.**—Where passing through cargo or bunker spaces, the pipes are to be protected by a substantial casing which is to be of steel in coal bunkers.

RIVETING.

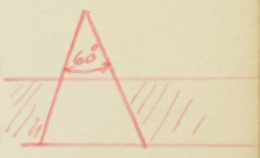
Section 30. 1. **Arrangement of Rivets.**—(*a*) The size and spacing of the rivets in the various parts of the structure are to be in accordance with the requirements of **Tables 38** to **40**.

The diameter of the rivet is to be regulated in general by the greater thickness of the parts to be connected, but where the difference is considerable, special consideration will be given.

(*b*) Chain riveting is to be adopted for the butts of shell plating and for double and treble riveted joints, except for the connections to bar keel, stem, and sternpost.

2. **Form of Rivet.**—Rivets are to be increased in size under their heads in order to fill the rivet holes properly. Pan-headed rivets are to be of the form shown in **Table 39**, except where the holes have been drilled.

3. **Countersinking.**—(*a*) The rivet holes in the plating of the shell, weather decks, inner bottom and bulkheads of peak tanks and deep tanks, are to be countersunk.



(*b*) The countersinking of the rivet holes is to extend through the whole thickness of the plate or angle where the thickness does not exceed ·50 inch. Above this thickness the countersinking is to extend through nine-tenths the thickness of the plate.

(*c*) The angles of countersink for plates whose thickness does not exceed ·50 inch is to be about 60 degrees and for plates exceeding this thickness the angle is to be about 45 degrees.

4. **Spacing of Rows of Rivets.**—(*a*) The breadths of butt straps, end laps, and edge laps, are to be in accordance with the requirements of **Table 38**.

(*b*) Rivets are to be kept sufficiently clear of edges of material and of each other, and the distance from the centre of rivet hole to the edges of plating, butt straps, end laps, or angle bars, is not to be less than one-and-a-half rivet diameters.

The distance between the centres of consecutive rows of rivets is to be two-and-a-half rivet diameters for edge laps: three rivet diameters for butt straps; three-and-a-half diameters in end laps.

5. **Rivets in Seams of Shell Plating.**—(*a*) The riveting of the seams of shell plating is to be as required by **Table 40**.

(*b*) In vessels 275 feet and above in length the seams of the side shell plating are not to be less than double riveted.

(*c*) In vessels above 500 feet in length an additional pair of rivets is to be fitted in each frame space in three seams at about one-half the depth of the vessel for one-fourth of the vessel's length in the fore and after bodies. The actual position of this additional riveting is to depend on the arrangement of the shell plating and the special design of the vessel in each case. In vessels above 525 feet in length one of the above seams, and in vessels above 550 feet in length two of the above seams, are to be treble riveted, the remaining seams or seam to be additionally riveted. Where the length of the vessel exceeds 600 feet the three seams are to be treble riveted.

Each case requiring this additional riveting is to be submitted for the approval of the Committee.

(*d*) In single riveted seams one frame rivet is to be fitted through the seams at each frame.

In double riveted seams one frame rivet is to be fitted through the seams at each frame, except where the frames or edges of the plating are joggled when two rivets are to be fitted.

In treble riveted seams two frame rivets (the upper and lower) are to be fitted through the seams at each frame.

6. **Spacing of Rivets.**—(*a*) All butt straps and end laps are to have complete rows of rivets.

(*b*) The rivets attaching the shell plating to the bottom frames are to be spaced as follows :—

Where the frame spacing does not exceed 31½ inches, the rivet spacing is to be not more than 7 diameters.

Where the frame spacing exceeds 31½ inches but does not exceed 34½ inches, the rivet spacing is to be not more than 6½ diameters.

Where the frame spacing exceeds 34½ inches, the rivet spacing is to be not more than 6 diameters.

(*c*) The rivets attaching the shell plating to the side frames are to be spaced as follows :—

Where the frame spacing does not exceed 28½ inches, the rivet spacing is to be not more than 7 diameters.

Where the frame spacing exceeds 28½ inches, but does not exceed 31½ inches, the rivet spacing is to be not more than 6½ diameters.

Where the frame spacing exceeds 31½ inches, but does not exceed 34½ inches, the rivet spacing is to be not more than 6 diameters.

Where the frame spacing exceeds 34½ inches, the rivet spacing is to be not more than 5½ diameters.

(*d*) Where the framing consists of an ordinary frame and reverse bar as provided for in **Tables 2, 3** and **4**, the rivets attaching the reversed bars to the frames are to have the same spacing as the rivets through the frames and shell plating.

(*e*) In deep tanks and in fore and after peak tanks, the rivets through the frames and shell plating are to be spaced not more than 5½ diameters apart from centre to centre.

(*f*) Forward of the three-fifths length the rivets in both flanges of the frame angles connecting the floors to the shell plating are to be spaced not more than 5½ diameters apart from centre to centre.

(*g*) At the stem, sternframe, and bar keel, rivets are to be ¼ of an inch larger in diameter than required for the thickness of the plating, but need not in any case exceed 1⅛ inches in diameter, and are to be spaced 5 diameters apart from centre to centre. In single screw steamers above 350 feet in length, the after lengths of the shell plating are to be connected to the portion of the stern frame below the boss with three rows of rivets.

(*h*) In the after peak, the rivets connecting the frames to the floors and cross ties are to be spaced not more than five diameters apart from centre to centre.

7. **Butt Straps.**—Where single butt straps are fitted, the straps are to be 25 per cent thicker than the plates to be connected. Where double straps are fitted, the thickness of the countersunk strap is to be 70 per cent, and the thickness of the strap on the opposite side 60 per cent of the thickness of the connected plates.

8. **Connection of Longitudinal Angles between Frames.**—The number of rivets between frames in each flange of the angle bars connecting stringer plates and intercostal plates to the shell plating is to be in accordance with the following Table :—

Frame Spacing.	Number of Rivets.
Not exceeding 26 inches	4
„ „ 30 „	5
„ „ 33 „	6
„ „ 36 „	7

9. **Breadths of Flanges of Bars.**—The breadths of the flanges of connecting angles are to be not less than four times the diameter of the rivet, for rivets up to ⅞ inch in diameter, and three and one-half times for rivets one inch and over in diameter.

10. **General.**—The riveting requirements in various parts of the structure are to comply with the regulations indicated by the following references :—

(*a*) **Framing.—Section 6, clause 7.**

(*b*) **Straps of Web Frame and Side Stringer Face Bars.—Section 7, clause 2.**

(*c*) **Tank Side Brackets.—Section 10, clause 8.**

(*d*) **Bottom Forward.—Section 11, clause 4.**

(*e*) **Wider Frame Spacing.—Section 14, clause 9.**

(*f*) **Beam Knees.—Section 15, clause 3.**

(*g*) **Half Beams to Coaming Plates.—Section 15, clause 3.**

(*h*) **Pillars and Girders.—Section 16, clause 6.**

(*i*) **Bulkheads.—Section 17, clause 7.**

(*j*) **Shaft Tunnels.—Section 18, clause 5.**

(*k*) **Deep Tanks.—Section 19, clause 10.**

(*l*) **Oil Fuel Bunkers.—Section 20, Sub-Section B, clauses 6 & 7.**

(*m*) **Oil Fuel Compartments.—Section 20, Sub-Section C, clause 2; Sub-Section D, clauses 2, 3 & 5; Section 20A, clause 3.**

(*n*) **Detached Superstructures.–Section 22, clause 1.**

(*o*) **Ventilators.—Section 26, clause 2.**

CEILING AND CARGO BATTENS.

Section 31. 1. **Ceiling.**—(*a*) In single bottom vessels close ceiling is to be fitted from the centre keelson to the upper part of the bilges. The ceiling is to be made in hatches as far as practicable, but when not so arranged is to be fastened to the reversed frames in such a manner as to permit easy access for the purpose of survey, or for cleaning and painting.

(*b*) In vessels having double bottoms, ceiling is to be laid over the limbers at the bilges and under the hatchways. The ceiling at the limbers is to be readily removable for inspection of the bilges. Ceiling may be omitted under the hatchway provided the inner bottom plating is increased ·08 inch in thickness in way of the hatchways.

(*c*) Where the cargo is intended to be discharged by grabs or similar mechanical appliances, it is recommended that the ceiling be doubled or the inner bottom plating be increased ·20 inch in thickness.

(*d*) Where the covers or fittings of the manholes of the inner bottom in cargo holds project above the tank top, they are to be protected by an angle coaming around each manhole, fitted with a hatch either of wood or steel.

(*e*) If the ceiling be laid on the top of the plating, it is to be embedded in a substantial composition such as Stockholm tar and cement. If the ceiling be not so embedded, it is to be laid on battens $1\frac{1}{2}$ inches thick to permit the drainage water to pass to the wells or bilges.

(*f*) The thickness of the wood ceiling is to be not less than $2\frac{1}{2}$ inches in vessels exceeding 200 feet in length and 2 inches in all smaller vessels.

(*g*) The requirements regarding ceiling over double bottom compartments in which oil fuel is carried are set forth in **Section 20, Sub-Section D, clause 2** (*b*).

2. **Cargo Battens in Cargo Spaces.**—(*a*) Cargo battens are to be fitted above the upper part of the bilge and in the 'tween decks of all types of vessels and in permanently enclosed spaces in bridges, poops, and other deck superstructures.

(*b*) Cargo battens should be 2 inches in thickness, and the clear spacing between adjacent rows is not to exceed 9 inches.

(*c*) The cargo battens specified in the preceding paragraphs may be dispensed with at the request of the Owner. In such cases the certificate of classification will be endorsed "Cargo battens not fitted," and this notation will also be printed in the Register Book.

CEMENTING AND PAINTING.

Section 32. 1. **Cementing.**—(*a*) In single bottom vessels the frames and plating of the bottom to the upper parts of the bilges are to be efficiently covered with Portland or other approved cement, which may be mixed with sand or other material to form a suitable composition. Care is to be taken to have a proper thickness of cement at the edges, and to keep the watercourses clear all fore and aft.

(*b*) In double bottom vessels the frames and plating of the bottom are to be efficiently cemented in the tanks under the boiler room. Elsewhere inside the double bottom, cement may be dispensed with, with the exception of fillets at the seams and butts of the shell plating.

In all cases the plating at the bilges is to be efficiently cemented. Rivet Paint has been accepted in lieu of cement Bardyke Gordon.

(*c*) Where asphalt, enamel cement, or similar compositions are to be used, the same is to be sanctioned by the Owners, and samples are to be submitted for the approval of the Committee.

(*d*) Cementing may be dispensed with in the case of double bottoms intended solely for the carriage of oil fuel.

2. **Painting.**—(*a*) All steel and iron work, not covered with cement, should receive at least two coats of paint of suitable composition. Previous to the painting, the surface of the steel and iron is to be thoroughly cleaned, and the painting of external steelwork should be delayed as long as possible.

(*b*) If desired by the Owners, cement washing may be adopted inside of double bottom tanks instead of painting.

STEERING GEAR.

No chain tiller now required. Hand tiller in amidships compartment to be fitted in addition to main tiller may be of any reasonable type

Section 33. 1. **Steering Gear.**—(*a*) All vessels are to be fitted with two independent steering gears.

(*b*) In vessels exceeding 250 feet in length, one of the steering gears is to be operated by power.

(*c*) In all vessels an arrangement of blocks and tackle or other suitable alternative may be accepted as one of the two means for steering, provided it is fitted to the satisfaction of the Surveyor.

2. **Scantlings.**—(*a*) The scantlings of tillers and quadrants are to be as given in **Table 45.** Quadrants and tillers are to be well shrunk on or bolted to the rudder head in addition to being secured by a key of suitable size. The area of the arms at ends may be one-third of the area given in the Tables, and where a quadrant tiller is not keyed to the rudder head, the area of the arms of the

1169.

When a loose quadrant is fitted the depth of boss may be reduced 1/6

quadrant may be of these reduced dimensions throughout their length. Where cast steel tillers are fitted the scantlings are to be equivalent to those given in the Table.

(*b*) The diameters of steering chains or rods and the corresponding radii of quadrant tillers are given in **Table 45.** Where the radius of the quadrant or length of tiller adopted differs from that given in the Table, the diameter of steering chain is to be calculated from the following formula :—

$$d = \cdot 38\sqrt{\frac{D^3}{R}}$$

where d = diameter of chain in inches.

D = diameter of rudder head in inches.

R = radius of quadrant or length of tiller at the centre of the chain in inches.

(*c*) All steering chains are to be subjected to the tensile tests as set forth for short link cables in **Section 13** of the **Rules for the Quality and Testing of Materials** under the Society's supervision, and the certificates are to be produced.

(*d*) The scantlings of the blocks, tackle, leads and wires for the alternative means of steering are to be adequate for the purpose intended and are to be submitted for approval.

3. **Power of Engine.**—The power of the steering engine is to be such that the rudder can be put from hardover to hardover in 30 seconds while the vessel is going ahead at full sea speed.

4. **Rudder Stops.**—Suitable stops for the rudder should be securely fastened to the deck in way of the tiller or quadrant tiller. The stops of the steering engine are to be fitted at a smaller angle of helm than the rudder stops.

5. **Locking or Brake Gear.**—An efficient locking or brake arrangement is to be fitted to keep the rudder steady when a change of gear is required.

6. **Protection of Steering Gear.**—In steamers above 250 feet in length, not having full poops, the after steering wheel and gear are to be protected by a substantially constructed steel house.

7. **Springs.**—Springs or buffers are to be fitted to all power operated steering gears.

8. **Leads of Steering Chains.**—(*a*) The leads of the steering chains are to be as direct as possible and sharp bends are to be avoided.

(*b*) The diameters of leading block sheaves, measured at the centre of the chain, are not to be less than sixteen times the diameter of the steering chains, and the pins of the sheaves are not to be less than twice the diameter of the chains.

PUMPING ARRANGEMENTS.

Section 34. 1. **General.**—In steam vessels the pumping arrangements according to the division of holds, rise of floor and other conditions are to be as follows, and plans of these arrangements are to be submitted for approval.

2. **Hold and Tank Drainage.**—(*a*) All steam vessels are to be provided with efficient pumping plant, having the suctions and means for drainage so arranged that any water which may enter any compartment of the ship, or any watertight section of any compartment, can be pumped out through at least one suction when the vessel is on an even keel, and is either upright or has a list of five degrees. Wing suctions will not be required in narrow compartments at the ends of the vessel.

(*b*) Where close ceiling is fitted over the bilges, arrangements are to be made whereby water in a hold compartment may find its way to the suction pipes.

(*c*) Efficient means are to be provided for draining water from insulated chambers. (*See* **Section 3, clause 10, Rules for Refrigerating Machinery and Appliances**).

(*d*) Where the inner bottom plating extends to the ship's side the bilge suctions may be placed either in a well the full width of the double bottom, or in wells placed at the wings and also at the centre line if the top plating has inverse camber.

The latter wells are to be formed of steel plates and the capacity of each well is not to be less than six cubic feet.

Steel bilge hats of reasonable capacity may be used where the spaces to be drained are of small dimensions.

(*e*) Where access manholes to bilge wells are necessary, they are to be fitted as near to the suction strums as practicable.

3. **Engine and Boiler Space Drainage.**—(*a*) Where the engine and boiler spaces are common and there is no double bottom, and the rise of floor is not less than 5°, one centre main bilge line and one donkey pump direct suction are to be fitted; but, if the rise of floor is less than 5°, additional main line bilge suctions are to be fitted at the wings.

(*b*) Where the engine and boiler spaces are common and the double bottom extends the full length of the space, forming bilges at the wings, two power pump suctions (one of which may be a donkey pump direct suction) are to be fitted to the bilge on each side. Where the inner bottom plating extends to the ship's side three main bilge line suctions

and a donkey pump direct suction are to be fitted, either in a well the full width of the double bottom or in wells, placed at the wings and also at the centre line where the top plating has inverse camber.

(*c*) Where the engine and boiler spaces are separate the number and position of the main bilge line suctions are to be the same as in cargo holds. In addition to the main bilge line suctions in the engine room a donkey pump direct suction is to be fitted.

(*d*) The main water circulating pumps are to be fitted with direct bilge suction connections, provided with non-return valves, to the lowest level in the machinery space and of a diameter at least two thirds that of the sea inlet.

(*e*) The number of power driven bilge pumps is to be in accordance with the requirements of **Section 4** of the Engine and Boiler Rules; but, in lieu of the bilge pump direct suction to the engine room referred to in **clause 5** of that Section, a steam ejector suction of the same bore may be fitted.

4. **Fore and After Peak Drainage.**—(*a*) Where the peaks are fitted as water ballast tanks, a separate power pump suction is to be led to each. Where not used for water ballast and a main bilge line suction is not fitted, an efficient manual pump is to be fitted in the fore peak. Where the after peak is used as a ballast tank no drain valve or drain cock is to be fitted to the bulkhead; but where not so used, and where no manual pump or main bilge line suction is fitted in it, a drain valve or drain cock is to be fitted to the bulkhead to allow water to reach the pumps when required. Where either the fore peak tank top flat or the chain locker is below the load water line, a manual pump or a power pump suction is to be provided.

(*b*) Where a suction pipe is led from the engine room through a hold space to the fore peak, it is to be provided with a screw-down valve capable of being operated from an accessible position above the load water line, the chest being secured to the collision bulkhead inside the fore peak.

5. **Tunnel Drainage.**—The tunnel well is to be fitted with a power pump suction.

6. **Pipe System.**—(*a*) The arrangement of valves and their connections are to be such as to prevent the possibility of water passing from the sea or from water tanks into the cargo or machinery spaces, or from one compartment to another. To effect this requirement, the bilge connection to any pump having also a suction from the sea should be made either by means of a non-return valve or a cock which cannot be open at the same time to the sea, or to water tanks and to the bilges. Valves in all bilge distribution boxes are to be of the non-return type.

(*b*) Cocks and valves connecting all bilge suction pipes are to be fixed in accessible places above the stokehold and engine room platforms.

(*c*) All pipes from the pumps which are required for draining cargo or machinery spaces are to be entirely distinct from pipes which may be used for filling or emptying spaces where water is carried.

(*d*) Bilge suction pipes are not to be carried through the double bottom tanks, if, as is generally the case, it is possible to avoid doing so. Bilge pipes where they pass through deep tanks and are subject to the full pressure due to the head of water in the tanks are to be of substantial strength and are to be tested, after fitting, to the same pressure as the tanks through which they pass.

(*e*) All suction pipes are to be efficiently secured in position and strapped to prevent lateral movement and are to be made in suitable lengths with flanged joints.

(*f*) Efficient expansion joints or bends are to be provided in each range of pipes and where the connections at bulkheads and other structural parts of the vessel are made with lead bends the radii of the bends and the distance between the axes of the straight parts of the pipe are each to be not less than three diameters, and the length of the bend is to be at least eight diameters of the pipe.

(*g*) The suctions in machinery spaces are to be led from easily accessible mud-boxes placed, whenever practicable, above the level of the working floor, with straight tail pipes to the bilges, and having covers secured in such a manner as to permit of them being expeditiously opened and closed. The suction ends in hold spaces are to be enclosed in strum-boxes having perforations not more than $\frac{3}{8}$ inch in diameter whose combined area is not less than twice that of the suction pipe, and the boxes are to be so constructed that they can be cleared without breaking any joint of the suction pipe. Suction pipes in tunnel wells are to have similar strum-boxes.

(*h*) Lead pipes are neither to be used within coal bunkers nor are they to be attached to bunker bulkheads, except in the case of steam tugs and tenders.

7. **Bilge Pumps.**—(*a*) Each power bilge pump is to be arranged to draw water from any hold or machinery compartment of the vessel, except where manual pumps only are permissible.

(*b*) Each independent power pump is to be capable of giving a speed of water through the pipes of the largest diameter required by the formula (**clause 9**) of not less than 400 feet per minute, under ordinary working conditions.

(*c*) Manual pumps are at all times to be workable from a position above the load water line.

8. **Watertight Bulkhead Fittings.**—(*a*) No drain valve or drain cock is to be fitted to the collision bulkhead.

(*b*) No drain valves or drain cocks are to be fitted to the engine and boiler room bulkheads, or other watertight bulkheads, unless they are arranged so as to be accessible at all times and are so geared that they may be shut off from a position above the load water line.

(*c*) Where owners desire to fit non-return valves to bilge suction pipes in order to decrease the risk of flooding after damage, such valves are to be of an approved pattern.

(*d*) All other cocks and valves in connection with bilge and ballast suction pipes, unless otherwise specifically mentioned in the Rules, are to be fitted in places where they are at all times accessible.

(*e*) In the case of deep tanks which may be used for either water ballast or cargo, provision is to be made for blank flanging the water ballast filling and suction pipes when the tank is being used for cargo, and for blank flanging the bilge suction pipes when the tank is being used for water ballast.

(*f*) Valve chests, cocks, pipes, and other fittings attached to the bulkheads or to the tunnel plating are to be secured by means of studs screwed through the plate, or by tap bolts, and not by bolts passed through clearing holes.

9. **Diameters of Bilge Suction Pipes.**—(*a*) The inside diameters of bilge suction pipes, in inches, are to be in accordance with the following formulæ to the nearest quarter inch.

$$\sqrt{\frac{L\,(B + D)}{2500}} + 1$$

for main bilge line suctions and direct bilge suctions to the pumps ; and

$$\sqrt{\frac{C\,(B + D)}{1500}} + 1$$

for branch suctions to cargo and machinery spaces,

where L = length of vessel, in feet.
B = breadth of vessel, in feet.
D = moulded depth to bulkhead deck, in feet.
C = length of compartment, in feet.

No main suction pipe is, however, to be less than 2 inches in bore, and no branch pipe is to be less than 2 inches in bore, or need be more than 4 inches in bore.

(*b*) Bilge suction pipes to fore and after peaks, and to the tunnel well, are to be not less than $2\frac{1}{4}$ inches inside diameter, except in vessels not exceeding 200 feet in length, in which case they may be 2 inches diameter.

10. **Air Pipes.**—Air pipes are to be fitted at the outboard corners of the water ballast tanks at the opposite end of the tank to that at which the filling pipes are placed, or at the highest part of the tank.

Air pipes are to be led to above the load water line.

In the case of tanks which can be pumped up the total sectional area of their air pipes is not to be less than the area of their respective filling pipes, and their discharge ends are to be always open.

11. **Sounding Pipes.**—All water spaces and compartments, except the main engine and boiler compartments, are to be provided with straight open-ended sounding pipes, which, together with the bilge pipes and air pipes, are to be effectively protected where necessary against risk of damage from cargo or coal, and a thick steel doubling plate is to be securely fixed below each sounding pipe for the rod to strike upon. Sounding pipes, including those for the double bottoms below machinery spaces, should extend to positions at or above the load water line which are at all times accessible ; but, although such an arrangement is most desirable, it is not insisted upon in reference to double bottom tanks intended for water only and situated below machinery spaces, provided the ends of the sounding pipes are accessible in ordinary circumstances, and are furnished either with non-detachable screw caps or with cocks having parallel plugs with permanently secured handles so loaded that, on being released, they automatically close the cocks.

In the case of insulated holds sounding pipes are to be provided both above and below the insulation. These sounding pipes are to be insulated and not less than $2\frac{1}{2}$ inches in diameter. (*See* **Section 3, clause 11, Rules for Refrigerating Machinery and Appliances.**)

12. **'Tween deck Scupper Pipes.**—'Tween deck scupper pipes are to be fitted in accordance with the requirements of **Section 29, clause 2.**

13. **Vessels Fitted for Burning and Carrying of Oil used as Fuel.**—The requirements of **Section 20** are also to be complied with.

14. **Sailing Vessels.**—The requirements for pumping in sailing vessels are set forth in **Section 36, clause 9.**

CARRYING AND BURNING OF OIL FUEL.

Section 35. — Cancelled. Now incorporated in Section 20.

SAILING VESSELS.

Section 36. 1. **General.**—Sailing vessels are to be constructed in accordance with the rules and regulations for steamers, with the exceptions contained in the following clauses.

2. **Framing.**—(*a*) All reversed frames are to extend to the upper deck.

(*b*) Sailing vessels above 20 feet, and not exceeding 33 feet moulded depth, are to have one tier of beams below the upper deck, spaced not more than two frame spaces apart, or equivalent transverse stiffening is to be provided.

(*c*) Sailing vessels above 20 feet, and not exceeding 27 feet moulded depth, are to have a deep web frame, of the breadth and thickness of the second deck stringer plate, fitted in way of each mast, and connected to the outside plating with double angles. These web frames are to extend to the upper deck, and are to be provided with efficient lateral support.

(*d*) Where the moulded depth is above 27 feet, and does not exceed 33 feet, instead of the deep web frames prescribed in the preceding paragraph, partial bulkheads, with efficient lateral support, are to be fitted in way of each mast.

3. **Panting Arrangements.**—In addition to the panting arrangements required by **Section 7**, panting beams and stringers are to be fitted at the after end of the vessels where the moulded depth exceeds 15 feet.

4. **Beams.**—Where the length of the midship beam does not exceed 30 feet, the upper and second deck beams are to be $\frac{1}{2}$ inch deeper than given in **Tables 12** and **13** for upper deck beams of the same length in steamers where one tier of beams only is fitted; and where the length is above 30 feet the upper, second, and third deck beams are to be one inch deeper than given in the Tables. The depths of the beam knees are to be correspondingly increased.

5. **Bulkheads.**—In sailing vessels only the foremost or collision bulkhead will be required, and it is to be placed at not less than one-tenth the vessel's length abaft the fore part of the stem.

6. **Decks.**—(*a*) In vessels which are not required to have complete steel decks, the decks in way of the masts are to be plated from side to side of the vessel.

(*b*) The thickness of wood decks is not to be less than $3\frac{1}{2}$ inches, and the margin planks of the weather deck are to be of either teak or greenheart.

7. **Bulwark Stanchions.**—The stanchions which support the bulwarks are not to be spaced more than 5 feet apart. Where stanchions are fitted on the butt straps of the bulwark plating, the straps are to be sufficiently broad to receive the spur in the middle of the stanchion, and the bulwark plating is to be doubled or fitted with vertical straps in way of the intermediate stanchions. The heel of each stanchion is to be attached by not less than four $\frac{7}{8}$ inch bolts. Their size may be from $1\frac{3}{8}$ inches to 2 inches in diameter, regulated by the length of the stanchion and the size of the vessel.

8. **Mast Rings.**—The mast rings are to be formed of bulb angle of suitable size.

9. **Pumps.**—Hand pumps are to be fitted in number and position as may be required for the efficient draining of the vessel. The pumps are to be capable of being worked from the upper deck or from above the load waterline, and the bottoms of the pump chambers are not to be more than 24 feet above the suction rose.

The sizes of the hand pumps are not to be less than given in the following Table:—

Tonnage under Upper Deck.	Hand Pumps.	
	Diameter of Barrel.	Diameter of Tail Pipe.
	Inches.	Inches.
Not exceeding 500 tons	4	2
Above 500 tons but not exceeding 1,000 „	$4\frac{1}{2}$	$2\frac{1}{4}$
„ 1,000 „ „ 2,000 „	5	$2\frac{1}{2}$
„ 2,000 tons	$5\frac{1}{2}$	$2\frac{3}{4}$

10. **Equipment.**—(*a*) Where a sailing vessel has a poop, bridge, top-gallant-forecastle, or a raised quarter-deck, the equipment number is to be increased one-fifteenth above that for a flush-deck vessel.

(*b*) One of the bower anchors must have the weight required by the Tables, but otherwise the weights of bower anchors may be regulated in accordance with **Section 40, clause 4** (*a*).

11. **Strengthening of Bottom Forward.**—The requirements of **Section 11** of the Rules do not apply to Sailing Ships.

MASTS, SPARS AND RIGGING.

Section 37. Sailing Vessels. 1. Lower Masts.—(*a*) The scantlings of lower masts are to be as given in **Table 49** and the length of the mast is to be measured from the deck to the hounds.

(*b*) The mizzen masts of barques may be reduced one-fifth in diameter from that given in the Table, and the thickness of the plating may be in accordance with the reduced diameter.

(*c*) The diameter of the lower mast at the cap is not to be less than that of the heel of the topmast, nor less than the greatest diameter of the lower topsail yard at centre.

(*d*) Where angle stiffeners are required these stiffeners are to be fitted for the full length of the masts.

(*e*) The butts of the plating are to be treble riveted above the mast partners; elsewhere they may be double riveted. The seams are to be double riveted throughout.

(*f*) Where pole masts are fitted, the length for determining the scantlings of the lower mast is to be taken from the deck to the hounds. In such masts additional strengthening is to be provided from below the lower yard to above the normal position of the lower mast cap.

(*g*) Doubling plates are to be fitted in way of the mast wedging and where masts are wedged at more than one deck, the doubling plates are to extend from below the lower to above the upper wedging.

(*h*) The heels of all masts and their steps are to be efficiently strengthened.

2. **Topmasts.**—(*a*) The length of the topmast is to be measured from the lower mast cap to the topmast hounds.

(*b*) The plating is to be of the thickness given in **Table 50.** The butts are to be treble riveted and the seams may be single riveted.

(*c*) The diameter of the topmasts at the lower cap, sheave hole and topmast cap is not to be less than that of the yards at these places.

(*d*) Doublings are to be fitted in way of the lower mast cap, in way of the fid holes and in way of the sheave holes where such are cut, and at the head.

(*e*) Efficient cheek plates are to be fitted to topmasts whose length exceeds 24 feet.

3. **Topgallant Masts.**—The diameter of the topgallant mast is not to be less than the diameter of the topgallant yard.

4. **Yards.**—(*a*) The diameter of the yards and the thickness of the plating are to be in accordance with **Table 50.** The butts are to be double riveted and the seams single riveted.

(*b*) The plating is to be doubled in way of cleats and at the centre to beyond the truss hoops.

(*c*) Topsail and topgallant yards, where of pitch pine, are not to be less in diameter than $\frac{1}{4}$ inch per foot of length.

5. **Bowsprits.**—(*a*) The thickness of the plating is to be as given in **Table 49.**

(*b*) Doubling plates are to be fitted in way of the bowsprit wedging.

(*c*) Bowsprits exceeding 28 inches in diameter are to have a vertical diaphragm plate extending from within the wedging to beyond the bobstay band, connecting the upper and lower parts of the bowsprit, and, in addition, two angle stiffeners of the size given in the Table are to be fitted. Bowsprits 28 inches and under in diameter are to have angle stiffeners, extending the full length of the bowsprit, at the centre of each plate. The butts are to be double riveted and the seams single riveted.

6. **Steamers.**—(*a*) The length for determination of scantlings is to be measured from the deck to the hounds.

(*b*) The scantlings of the masts are to be in accordance with **Table 47,** and these scantlings are considered suitable for the support of average equipment of derricks of normal outreach provided the staying of the masts is efficient.

(*c*) Masts which are not intended to carry derricks may be 20 per cent. less in diameter than required by **Table 47,** and the thickness of the masts may be in accordance with the reduced diameter.

(*d*) The butts of the plating are to be treble riveted above the mast partners, and the seams are to be single riveted.

(*e*) Doubling plates are to be fitted at the heel, at the wedging, in way of the derrick supports, and at the hounds. The length of these doublings is not to be less than the maximum diameter of the mast.

7. **Rigging.**—(*a*) The shrouds and stays for steamers and sailing ships are to be in number and size as required by **Tables 48** and **51,** and they are to withstand the tests specified.

(*b*) Chain plates are to be securely connected to the structure of the vessel which is to be efficiently stiffened for this purpose where necessary.

(*c*) All smith work for masts, spars and rigging is to be of the best description of wrought iron, and particular attention is to be paid to workmanship.

8. **Lightning Conductors.**—Lightning conductors are to be fitted in accordance with the requirements of **Section 12** of the **Rules for Electric Fittings.**

TUGS.*

Section 38. 1. **General.**—The scantlings and arrangements of Tugs for which the Class 100A1 "For Towing Services" is desired, are to be as required by the Rules and Tables, except where specified otherwise in this Section.

2. **Floors.**—(*a*) The floors, if desired, may be flanged 3½ inches on the upper edge, in lieu of reversed bars, except in the engine room and under boiler bearers.

(*b*) Where the bottom of the vessel is filled solid with cement to the level of the top of the floors, the fitting of reversed frames, or the flanging of the floors, may be dispensed with.

3. **Keelsons.**—The scantlings of the keelsons are to be in accordance with the requirements of **Table 11.**

4. **Bulkheads.**—The scantlings of the bulkhead stiffeners and plating are to be in accordance with the requirements of **Tables 29** and **31.** Bracket or lug attachments need not be fitted at the ends of the stiffeners.

5. **Decks.**—The deck is to be completely plated over abreast the machinery openings.

6. **Machinery Casings.**—(*a*) The machinery casings are not to be less in height than 3 feet above the top of the deck, and are to extend to the underside of the deck beams. The casings are to be connected to the deck plating with angle bars, and to the ends of the half beams with angle lugs. If the casings are not extended to the underside of the beams, they are to be attached to the deck plating by a double riveted angle bar, or the deck plating may be turned up the casing side and double riveted thereto.

(*b*) Machinery casings are to be hose tested on completion to ensure watertightness.

(*c*) A strong through beam is to be fitted at the deck level at the middle of the length of the machinery opening, and, if practicable, should be associated with webs on the sides of the casing.

7. **Hatchways.**—Hatch coamings are not to be less than 12 inches in height, and the covers and battening arrangements are to comply with the requirements of **Section 25.**

8. **Rudders.**—The diameter of the rudder head is to be increased half-an-inch beyond that required by **Table 41,** and all the scantlings of the rudder are to be in accordance with the increased diameter.

9. **Equipment.**—The equipment for Tugs is to be as given in **Table 55.** The equipment to be supplied to vessels of this type is to be regulated by the second longitudinal numeral $L \times (B+D)$, without any addition for casings or other erections.

10. **General.**—The requirements of **Section 7** and **Section 11** do not apply to Tugs.

WORKMANSHIP.

Section 39. 1. **General.**—The workmanship is to be well executed and submitted to the closest inspection.

2. **Treatment of Material.**—(*a*) It is recommended that cementing or painting be delayed as long as possible so that the removal of the black oxide or mill scale may be facilitated.

(*b*) Experience has shown that, as regards durability, it is highly desirable to place steel vessels in dry dock within a reasonably short period after being launched for the purpose of cleaning and re-coating the bottom.

3. **Riveting.**—(*a*) Rivet holes are to be regularly spaced and are to be carefully punched from the faying surfaces wherever possible.

(*b*) Rivet holes are to be properly formed and the burr caused by punching removed before the parts are fitted together for riveting.

(*c*) The rivet holes at the turn of the bilge in frames are not to be punched until the frames are bent to the required shape.

(*d*) Before riveting is commenced the work is to be carefully closed with nut and screw bolts, which are to be spaced sufficiently close to draw the parts together effectively.

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* NOTE.—**Trawlers.**—*The Society's requirements regarding the Construction and Classification of Steel Trawlers are published separately.*

(*e*) Unfair holes are to be properly rimered and re-countersunk if necessary and are not to be cut with a chisel or unduly drifted.

(*f*) The rivets are to be staved up so as to fill the holes completely, and their heads are to be properly laid up. The points are to be left full, but are not to be spread over the plating.

(*g*) The punches and dies are to be maintained in satisfactory condition.

4. **Joggling and Lining Pieces.**—(*a*) Where plates or bars are joggled, care is to be taken to ensure that the depth of joggle is the same as the thickness of the adjacent plating.

(*b*) Where lining pieces are fitted they are to be in one piece and are to be of the same breadth as the flange of the frames.

5. **Caulking.**—Caulking is to be carefully and thoroughly executed.

EQUIPMENT.

Section 40. 1. **Notation.**—The figure **1** placed after the character assigned to a vessel indicates that the equipment is considered to be suitable and is in good and efficient condition.

2. **Equipment Number.**—The equipment of anchors, chains, hawsers, and so forth, is to be regulated by the second numeral L × (B + D) to which an allowance for superstructures is to be added as follows :—

(*a*) For a raised quarter deck the product of the height and length in feet.

(*b*) For a poop, bridge, or forecastle, three-fourths the product of the height and length in feet.

(*c*) For deckhouses or other erections which do not extend to the side of the vessel but which exceed, either in length or breadth, one-half the breadth of the vessel, one-half the product of the height and length in feet.

3. **Testing of Equipment.**—(*a*) All anchors and cables are to be tested at a public machine recognised by the Committee and in accordance with the requirements of **Sections 11, 12 and 13 of the Rules for the Testing of Materials.**

(*b*) In the case of vessels whose anchors and chains have been tested at one of the recognised Proving Establishments in Great Britain and Ireland, the notation "Lloyd's A&CP" will be made in the Register Book.

(*c*) In the case of vessels of other than British Registry classed with the figure **1**, in which the anchors, chains, or both, have been tested under the inspection of the Society's Surveyors at Proving Establishments out of Great Britain and Ireland recognised by the Committee, and test certificates are furnished, duly signed by the Society's Surveyors, the vessel will have recorded in the Register Book the notation "Lloyd's A&CP," "Lloyd's AP," or "Lloyd's CP," as the case may be.

(*d*) Where, however, the anchors or chains for vessels of other than British Registry are manufactured out of Great Britain and Ireland, and test certificates are furnished setting forth that they have been tested at a Government machine, or at a machine under the control of a municipal body or a similar responsible body, but not under the inspection of a Surveyor to the Society, the record of Lloyd's A&CP, and so forth, will not be made in the Register Book, though such certificates will be accepted as satisfying the requirements of the Rules as regards tests in assigning the figure **1**.

(*e*) Certificates stating that all anchors and chains have been tested, and giving particulars of the loads applied, are to be produced before the ship is classed with the figure **1**.

4. **Equipment.**—(*a*) All vessels classed **100A1**, or **100A1** "with freeboard," are to be provided with anchors, cables, and hawsers, in number, weight and length as set forth in **Tables 53** and **54**. Provided the collective weight of the bower anchors is not less than required by the Tables, then :—

(1) The bower anchors may be of equal weight ; or

(2) Where three bower anchors are required, one of them may be 15 per cent and another 7½ per cent lighter than the weight required by the Tables ; or

(3) Where only two bower anchors are required, one of them may be 7½ per cent lighter than the weight required by the Tables.

The weights of cables include two end shackles to each cable (*i.e.* four end shackles for each outfit which contains two cables), and two end shackles to each stream chain.

(*b*) In the case of vessels classed **A** "For Special Services," the equipment is to be as required by the Committee, having in view the particular trade in which the vessel is to be engaged.

(*c*) To entitle vessels classed A "For Channel Purposes" to the figure 1, the equipment of anchors, chains, and so forth, is to be as required by **Table 53**, except that not more than two bower anchors and one stream anchor need be supplied. The first bower anchor is to be of the full weight required by the Table and the second bower may be 15 per cent lighter. This rule, however, applies only to vessels intended for short voyages.

(*d*) In vessels classed "For Channel Purposes," which are intended for longer voyages, such as the Queenboro-Flushing, the Channel Islands or the Irish Sea service, the equipment is to be in accordance with the requirements of the Tables.

(*e*) The equipment for Tugs is to be as given in **Table 55**, the equipment numeral being computed as described in **Section 38, clause 9.**

5. **Anchors and Chains.**—(*a*) The anchors and the links of the chains are not to be of exceptionable form or proportions.

(*b*) All anchor stocks are to be of acknowledged and approved description and equal to one-fourth the specified weight of the anchor.

(*c*) The heads of stockless anchors are to be not less than three-fifths of the total weight of the anchor.

6. **Renewal of Chain Cable when worn.**—When any length of chain cable is so worn that the mean diameter at its most worn part is reduced to the size given in **Table 56** it is to be renewed.

7. **Windlass and Hawsepipes.**—(*a*) A substantial windlass is to be fitted of suitable size for the cable, and is to be efficiently secured. Stiffening under windlass is to be provided as required by **Section 16.**

(*b*) Hawsepipes are to be of sufficient size and thickness, and the arrangements such as to admit of an easy lead for the cable to the windlass or capstan.

8. **Boats.**—All vessels not exceeding 150 tons are to be provided with one good boat, and every vessel above 150 tons is to have a suitable number of boats.

The Surveyors are to examine and to report on the condition of the boats.

9. **Anchor Cranes and Boat Davits.**—(*a*) The sizes of the principal parts of anchor cranes are to be in accordance with **Table 52,** and the outreach of the cranes is to be sufficient to swing the anchors well clear.

(*b*) In the cases of boats and davits of ordinary proportions the diameter *d*, in inches, of the davit is to be obtained by using the formula :—

$$d = \sqrt[3]{\frac{L \times B \times D\,(H + 4S)}{C}}$$

where L, B and D are the length, breadth and depth respectively of the boat, H is the height of the davit above its uppermost point of support, and S is the outreach of the davit ; each of these distances being in feet.

The value of the constant C is to be as follows :—

(1) When the davit is to be of wrought iron and of sufficient strength to carry the boat and its equipment, and a sufficient number of men to launch it, the value of C is to be 144.

(2) When the davit referred to in (1) is to be of wrought ingot steel from 27 to 32 tons per square inch tensile strength, the value of C is to be 174.

(3) When the davit is to be of wrought iron and of sufficient strength to lower safely the boat fully equipped and carrying the maximum number of persons for which it is intended, the value of C is to be 86.

(4) When the davit referred to in (3) is to be of wrought ingot steel of from 27 to 32 tons per square inch tensile strength, the value of C is to be 104.

(*c*) Boat and anchor davits may be approved of weldless rolled or drawn steel tubes of the equivalent sizes given in **Table 52,** provided the steel of which the davits are made has a tensile strength of not less than 35 tons per sq. in. with an elongation of not less than 10 per cent in a length of 8 ins.

(*d*) The davits are to have solid heels and are to be efficiently strengthened in way of the heads and deck supports.

10. **Notation Withdrawn.**—Where the equipment is not in accordance with the requirements of the Rules, a dash thus –, will be inserted in place of the figure 1. In cases where the figure 1 is expunged on account of deficiencies in the anchors or chains, the record of Lloyd's A&CP will also be expunged.

STRENGTHENING FOR ICE NAVIGATION.

Section 41. 1. **Framing** :—(*a*) Forward of the collision bulkhead, intermediate frames are to be fitted extending from below the level of the floors to the deck next

See Circ 1646

The web frame spacing is not to be exceeded in way of Ice Stiffening

Section 41

above the load waterline, with scantlings as required by **Tables 2, 3** and 4 for angle frames in peaks, but with thickness ·10 inch greater.

(*b*) Abaft the collision bulkhead, web frames, of scantlings as required by **Section 7, clause 2A** and **Table 5** of the Rules, spaced four frame spaces apart, are to be fitted for a distance from the stem equal to at least 12½ per cent of the length of the vessel.

In addition, intermediate frames with scantlings as required by **paragraph** (*a*) are to be fitted extending aft from the stem for a distance equal to 20 per cent of the length of the vessel where the length does not exceed 200 feet, graded to 15 per cent of the length of the vessel where the length is 400 feet and above. These intermediate frames are to extend either from the margin plates or, in single bottom vessels, from below the top of the floors, to the deck next above the load waterline; these frame, need not be connected at their ends.

(*c*) Where web frames are not fitted, all the main frames abaft the collision bulkhead for a distance from the stem equal to 15 per cent of the length of the vessel are to be in accordance with the requirements of **Section 7, clause 2B** and **Table 5A**. The attachments at the ends of these frames are to be as required by **Section 7, clause 2B**. Intermediate frames, of scantlings required by **Tables 2, 3** and 4 for bulb angle frames in peaks, are to be fitted for the extent prescribed in **paragraph** (*b*).

(*d*) The intermediate frames required by this clause may be dispensed with provided the frame spacing is reduced to 18 inches and the scantlings of the side framing are made equivalent. This reduced frame spacing is to extend aft for the distance prescribed in **paragraph** (*b*).

(*e*) The breadth of the shell flange of the frames is to be suitable for the increased thickness of shell plating required by this Section.

2. **Shell Plating.**—From 1 foot above the load line to 4 feet below the light line, and in a fore and aft direction from the stem to a point at least as far aft as the extent of the reinforced framing, the shell plating is to be fitted of a thickness equal to that required by the Rules for side shell plating amidships increased by 40 per cent if intermediate frames are fitted, or by 50 per cent if a frame spacing of 18 inches is adopted; the increased thickness of shell plating need not in any case exceed 1 inch. The shell plate in each strake immediately abaft this point is to be intermediate in thickness between the full amount required for ice strengthening under this clause and the usual Rule thickness. Seams of shell plating are to be not less than double-riveted.

3. **Stringers.**—(*a*) In the fore peak the panting stringers required by **Section 7** of the Rules are to be fitted 6 feet apart in association with panting beams as required by that Section.

(*b*) Where the web frame system is adopted, side stringers spaced 6 feet apart and having scantlings in accordance with the requirements of **Section 7, clause 2A** and **Table 5**, are to be fitted abaft the collision bulkhead. These stringers are to be tapered off over three spaces and carried aft to the normal thickness of the side plating.

(*c*) Where the deep frame system is adopted, side stringers, spaced 6 feet apart and having scantlings as required by **Section 7, clause 2B** and **Table 5A**, are to be fitted abaft the collision bulkhead. These stringers are to be extended aft as required by **paragraph** (*b*).

4. **Rudder and Steering Arrangements.**—The rudder head is to be increased 10 per cent in diameter above the Rule requirements, and all the scantlings of the rudder and steering equipment are to be in accordance with the increased diameter.

5. **Screw Shaft.**—The diameter of the screw shaft is to be increased 5 per cent above that required by the Rules.

6. **Propeller Blades.**—The propeller blades are to be made of cast steel, or other approved material.

7.—**Circulating Inlets.**—The main water circulating inlet valve is to be provided with a connection from the boilers for clearing purposes.

8. **Discharge Valves.**—All overboard discharge valves are to be fitted in such positions on the ship's side plating that the discharge will not be obstructed by ice at any possible draught of the vessel.

9. **Plans to be Submitted.**—Where it is desired that a vessel should receive the notation for ice strengthening (*see* par. (*g*), page 9), plans showing the proposed arrangements should be submitted for the approval of the Committee.

GENERAL.

Section 42. 1. **Equivalents.**—Any arrangement or fitting which, in the opinion of the Committee, is in all respects as efficient as that required by the Rules may be accepted instead of such arrangement or fitting.

The Owners' consent to the adoption of any proposed equivalent is to be obtained where considered necessary by the Committee.

2. **Interpolation.**—For numerals and dimensions intermediate between those given in the Tables, scantlings are to be obtained by proportional interpolation.

For a particular numeral the Table gives the minimum requirements and where a numeral is in excess of a Table numeral, the scantling to be taken is to be the nearest practicable above the requirements for the Table numeral.

3. **Gradual Reductions.**—(*a*) Where scantlings are required to be adopted over a proportion of the vessel's length, any reductions which may be permitted toward the ends of the vessel are to be effected gradually.

(*b*) Care is to be taken as far as possible to avoid any abrupt changes or discontinuities in the form of the structure, and where such occur suitable structural compensation is to be provided.

4. **Buttstraps to Continuous Longitudinal Angles.**—Buttstraps need not be fitted to continuous longitudinal angles which serve simply as connecting bars, except in the case of the stringer bars on strength decks.

5. **Items not Particularly Specified.**—Where special reference is not made in the Rules to specific requirements, the construction is to be reasonably efficient for the intended service, and is to conform to good average practice.

By order of the Committee,

ANDREW SCOTT,
Secretary.

71, Fenchurch Street, London, E.C.3.
24*th April*, 1930.

Molasses Tanks. Bottom girder + 2 above piles each side usually disrupt by Bows
Rules + Transverse Bks.

RULES FOR THE CONSTRUCTION OF VESSELS INTENDED TO CARRY PETROLEUM IN BULK.

The attention of Builders and Owners is directed to the fact that compliance with these Rules may involve the obtaining of licences under existing patents.

NOTE.—The Tables referred to herein are those appearing on pages 355 to 408 (*tinted paper*).

GENERAL.

Section 1. 1. **Application.**—The "**General Regulations relating to the Classification of Steel Vessels**" and the "**Rules for the Building of Steel Vessels**" determine the scantlings, arrangements and equipment of vessels intended for the carriage of petroleum in bulk, except as otherwise required by these Rules and Tables.

The Rules are framed for vessels built on the longitudinal system of construction, having a centre line bulkhead, continuous expansion trunk between the upper and second decks, and a standard 'tween deck height of 8 feet.

Approval will be given to vessels built on other systems of construction subject to equivalent strength being provided.

The propelling machinery is assumed to be situated at the after end of the ship.

2. **Submission of Plans.**—In addition to the plans required by **Section 1** of the "**Rules for the Building of Steel Vessels,**" there are to be submitted for approval plans showing:—

(*a*) The arrangement of oil tanks and cofferdams;

(*b*) The construction of the transverse and longitudinal bulkheads;

(*c*) The bracket attachments of the transverses, the webs, the longitudinals and the horizontal stiffeners; and

(*d*) The construction of the vessel at the forward and after ends, including the machinery space and the arrangements at the junction of the transverse and longitudinal framing.

3. **Length of Oil Compartments.**—The Rules are framed for a length of the main oil compartments not exceeding 30 feet, and for a length of the summer tanks not exceeding 60 feet.

4. **Expansion Trunks.**—Continuous expansion trunks are to be fitted between the upper and second decks. Where the breadth of the expansion trunk exceeds 60 per cent of the breadth of the vessel, the arrangements are to be specially submitted for approval.

5. **Cofferdams.**—Cofferdams are to be fitted at the forward and after ends of the oil cargo spaces. The cofferdams are to be not less than 3 feet in length, and are to extend from the keel to the top of the continuous expansion trunk.

6. **Deck Erections.**—Vessels are to have forecastles as required by the **Rules for the Building of Steel Vessels.** A poop is to be fitted, adequately covering the machinery space.

7. **Cement.**—Cementing may be dispensed with in compartments intended for carrying oil in bulk.

8. **Rudders.**—The diameter of the rudder head is to be increased 10 per cent above the requirements of the **Rules for the Building of Steel Vessels,** and all the scantlings of the rudder are to be in accordance with the increased diameter.

BOTTOM TRANSVERSES.

Section 2. 1. **Scantlings.**—(*a*) The scantlings of the bottom transverses are to be as given in **Table 1,** and the upper edge of the transverse is to be parallel to the rise of floor line.

(*b*) The face bars on the transverses are to extend between the inner edges of the side transverses and of the bulkhead webs, and as close as practicable to the centre line bulkhead on the side opposite to the vertical webs.

(*c*) The scantlings determined for the midship tanks are to apply throughout the oil compartments.

(*d*) Lightening holes, not exceeding 10 inches in diameter, may be cut in the transverses, and are to be fitted midway between the notches for the longitudinals.

(*e*) Notches cut in the transverses for longitudinals are to be well rounded at the corners and are not to be rough punched.

2. **Bracket Attachments.**—(*a*) The distance from the ship's side and from the centre line bulkhead to the toe of the bracket is to be 10 per cent of the midship breadth of the vessel where this breadth is 30 feet, and 16 per cent where the breadth of the vessel is 70 feet, intermediate values being obtained by interpolation. The length of the vertical arm is to be as specified in **Section 3, paragraph 2** (*a*).

The brackets on the side of the centre line bulkhead opposite to the vertical web are to have the same dimensions, measured from the bulkhead and from the base line in each case, as are required for the brackets on the same side of the bulkhead as the vertical web.

(*b*) The thickness of the brackets is to be the same as that of the transverses.

(*c*) The brackets are to be flanged 5 inches on the edge. Where the length of the bracket along the edge exceeds 66 inches, stiffening angles $3\frac{1}{2} \times 3$ inches, of the same thickness as the bracket are to be fitted. Where the thickness of the bracket exceeds ·50 inch these angles are to be $3\frac{1}{2} \times 3\frac{1}{2}$ inches.

(*d*) The brackets are to be attached to the centre line bulkhead by a single angle, double riveted, which is to have the same thickness as the bracket plate. In vessels exceeding 420 feet in length where the spacing of transverses, in feet, multiplied by the length of the vessel, in feet, exceeds 4,300, and in all vessels exceeding 480 feet in length, these bars are to be doubled.

In the case of vessels between 420 and 480 feet in length, in which this product does not exceed 4,300, the brackets are to be attached to the centre line bulkhead by a single angle, double riveted, on one side of the bracket and a single riveted angle on the other side of the bracket.

(*e*) The brackets are to be attached to the transverses by double riveted overlaps. Where the brackets extend to the shell the overlaps are to be treble riveted, except where the overlap comes in way of a longitudinal, when it is to be quadruple riveted.

(*f*) The overlaps of the plates of the transverses are to be kept clear of the shell longitudinals as far as possible.

3. **Shell Attachment.**—(*a*) The angles attaching the transverse to the shell are to have the same thickness as the transverses.

(*b*) In vessels in which the spacing of transverses in feet, multiplied by the length of the vessel in feet, does not exceed 4,300, the transverses are to be attached to the shell by a single angle, double riveted. In all vessels whose length is greater than 480 feet and in vessels not exceeding 480 feet in length where the spacing of the transverses multiplied by the length of the vessel exceeds 4,300, an additional single riveted back bar is to be fitted.

4. **Stiffeners and Attachments to Longitudinals.**—(*a*) Each longitudinal is to be attached to the transverses by an angle which is to extend from the shell to the inner edge of the face bar and to half the height of the transverse alternately, but not lower than to the top of the lightening holes.

(*b*) These angles are to have scantlings in proportion to the tabular depth of transverse as prescribed by **Table 3.**

(*c*) The number and diameter of the rivets in the angles connecting the longitudinals to the transverse are to be in accordance with **Table 12.**

Where by the Table the broader flange of long stiffening angles exceeds 5 inches the number and diameter of the rivets are to be as required for 6 inch stiffening angles.

The diameter of the rivets in the short stiffening angles is to be the same as required for the rivets in the long stiffening angles.

(*d*) Where the breadth of the vessel does not exceed 40 feet the transverse is to be supported by a bracket at about the quarter breadth of the vessel.

Where the breadth of the vessel exceeds 40 feet, but does not exceed 60 feet, each transverse is to be supported by two brackets which are to be arranged on longitudinals adjacent to the toes of the transverse brackets.

Where the breadth exceeds 60 feet an intercostal girder, as required by **Section 5, clause 2,** and two brackets are to be fitted.

(*e*) Where the flange of the face bar exceeds 7 inches in breadth, at least two vertical supports are to be connected to the face bar.

SIDE TRANSVERSES.

Section 3. 1. **Side Transverses in Hold.**—(*a*) The side transverses are to be fitted in conjunction with the bottom transverses and the scantlings are to be determined by the spacing of the transverses, by the depth of the vessel

and by a depth "**d**" which is measured amidships from the upper edge of the bottom transverse at the centre line to the second deck at side at the middle of the length, and are given in **Table 2.**

The depth of the transverse at the points of the brackets is not to be less than the tabular depth in any case.

(*b*) The transverses are to be increased 1 inch in depth for each increase of one complete foot in the sheer of the second deck.

(*c*) The face bars on the transverses are to extend between the inner edges of the bottom and deck transverses.

(*d*) Lightening holes not exceeding 6 inches diameter may be cut in the transverses as close to the shell bar as possible, and are to be fitted midway between the notches for the longitudinals.

(*e*) Notches cut in transverses for longitudinals are to be well rounded at the corners and are not to be rough punched.

2. **Bracket Attachments.**—(*a*) Side transverses are to be attached to the bottom transverses by brackets the length of the vertical arms of which, measured from the face of the transverses, is to be equal to 25 per cent of the depth "**d.**" The arms of the brackets connecting the side and the second deck transverses are to be equal to 20 per cent of the depth "**d.**"

(*b*) The thickness of the bottom bracket is to be the same as the bottom transverse, and the thickness of the top bracket the same as the deck transverse.

(*c*) The brackets are to be flanged 5 inches on the edge. Where the length of the bracket along the edge exceeds 66 inches, stiffening angles $3\frac{1}{2} \times 3$ inches of the same thickness as the bracket are to be fitted. Where the thickness of the bracket exceeds ·50 inch these angles are to be $3\frac{1}{2} \times 3\frac{1}{2}$ inches.

(*d*) The side transverses are to be attached to the bottom and deck transverses by double riveted overlaps, and the brackets are to be attached to the transverses by double riveted overlaps. Where the brackets extend to the shell the overlaps are to be treble riveted, except where the overlap comes in the way of a longitudinal, when it is to be quadruple riveted.

(*e*) The overlaps of the plates of the transverses are to be kept clear of the shell longitudinals as far as possible.

3. **Shell Attachment.**—(*a*) The angles attaching the transverse to the shell are to have the same thickness as the transverse.

(*b*) The riveted attachment of the side transverses and the shell are to be the same as required by **Section 2, Clause 3** (*b*) for bottom transverses, except that the back bars need only be fitted in vessels exceeding 30 feet in depth.

4. **Stiffeners and Attachments to Longitudinals.**—(*a*) Two supporting brackets are to be fitted on longitudinals adjacent to the toes of the transverse brackets. Where the moulded depth of the vessel does not exceed 23 feet only one supporting bracket need be fitted.

(*b*) Each longitudinal is to be attached to the transverse by an angle which is to extend from the shell to the edge of the face bar and to half the depth of the transverse alternately. In way of the bottom brackets on the transverses all the angles are to extend to the edge of the bracket or face bar of the transverse. Where the transverses do not exceed 20 inches in depth all stiffening angles are to extend to face bar.

(*c*) At the upper half of the transverse the short and long stiffening angles are to have scantlings in proportion to the tabular depth of transverse as prescribed by **Table 3,** while at the lower half of the transverse all the stiffening angles are to be of the scantlings prescribed for long stiffening angles.

In vessels of 38 feet moulded depth and over, all the angles connecting the side longitudinals to the transverses are to be of the scantlings prescribed for long stiffening angles.

(*d*) The number and diameter of the rivets in the angle bars connecting the transverses to the longitudinals are to be in accordance with **Table 12.**

Where by the Table the broader flange of long stiffening angles exceeds 5 inches the number and diameter of the rivets are to be as required for 6 inch stiffening angles.

The diameter of the rivets in the short stiffening angles is to be the same as required for the rivets in the long stiffening angles.

(*e*) Where the flange of the face bar exceeds 7 inches in breadth, at least two horizontal supports are to be connected to the face bar.

5. **Side Transverses in 'Tween Decks.**—(*a*) The scantlings of the transverses in the 'tween decks are given in **Table 4.**

(*b*) Side transverses are to be attached to deck transverses by double riveted overlaps and in addition by double riveted brackets.

Brackets which extend to the shell and deck are to be attached to the transverses by treble riveted overlaps where the butt comes between the longitudinals, or by quadruple-riveted overlaps if the butt comes in way of a longitudinal.

(*c*) The brackets at the lower ends of the transverses are to be connected to the deck by a single angle, double riveted.

(*d*) The lengths of the arms of the brackets are to be one and a half times the depth of the side transverse, measured from the inner and lower edges of the side or deck transverses, as the case may be, and from the second deck. The brackets are to have the same thickness as the side transverses and are to be flanged 3 inches on the edge.

(*e*) The transverses are to be attached to the shell by single-riveted angles having the same thickness as the transverse.

(*f*) The attachments of the longitudinals to the transverses are to be as required for short stiffening angles by **Tables 3** and **12**. The thickness of these angles need not exceed the thickness of the transverse.

DECK TRANSVERSES.

Section 4. 1. **Scantlings.**—(*a*) The deck transverses fitted in conjunction with the side transverses are to have the scantlings given in **Tables 5, 6** and **7.**

(*b*) Lightening holes, not exceeding 4 inches diameter, may be cut in the transverses as close to the deck bar as possible, and are to be fitted midway between the notches for the longitudinals.

(*c*) Notches cut in transverses for longitudinals are to be well rounded at the corners and are not to be rough punched.

2. **Upper Deck Transverses in Expansion Trunk.**—(*a*) The web plates on the expansion trunk and centre line bulkhead are to be connected to the deck transverses by double riveted overlaps. Where the vertical webs extend to the deck the overlaps are to be treble riveted.

(*b*) The transverses are to be attached to the deck by a single riveted angle having the same thickness as the transverse.

(*c*) The angles attaching the deck longitudinals to the transverses are to extend to the bottom of the transverse and to a distance not less than six inches below the lower edge of the longitudinals alternately. Where the distance from the lower edge of the longitudinal to the bottom of the transverse is less than six inches, the angles are to extend to the bottom of the transverse.

These angles are to have scantlings of the dimensions and number of rivets required for short stiffening angles by **Tables 3** and **12,** but the thickness need not exceed the thickness of the transverse.

3. **Upper Deck Transverses in "Summer" Tank.**—(*a*) The face bar on the lower edge of the transverses is to extend from the side of the expansion trunk to the edge of the side transverse in the 'tween decks.

(*b*) The transverses are to be attached to the deck by a single riveted angle having the same thickness as the transverse.

(*c*) The angles attaching the deck longitudinals to the transverses are to extend to the upper edge of the face bar. These angles are to have flanges of the dimensions and number of rivets required for short stiffening angles by **Tables 3** and **12,** but the thickness need not exceed the thickness of the transverse.

4. **Second Deck Transverses.**—(*a*) The face bar on the upper edge of the transverse is to extend from the centre line bulkhead to the first deck longitudinal, and the face bar on the lower edge is to extend from the side transverse to the web on the centre line bulkhead.

(*b*) The transverse is to be attached to the deck by a single angle, double riveted, having the same thickness as the transverse.

(*c*) The angles attaching the deck longitudinals to the transverse are to extend to the upper edge of the face bar. These angles are to have flanges of the dimensions and number and diameter of rivets required for short stiffening angles by **Tables 3** and **12,** but the thickness need not exceed the thickness of the transverse. Where the depth of the transverse is 24 inches or above the angles are to have the scantlings prescribed by the Table for long stiffening angles.

(*d*) Horizontal gusset plates, ·04 inch greater in thickness than the transverse, are to be fitted on the upper edge of the transverse on each side of the centre line bulkhead.

5. **Bracket Attachments.**—(*a*) The brackets attaching the upper deck transverses in the expansion trunk to the centre line bulkhead on the side opposite the web are to have the same thickness as the transverse. The depth of the brackets measured from the deck is to be twice the depth of the transverse. The horizontal arm of the brackets, measured from the bulkhead, is to be two-thirds the depth of the bracket, measured from the deck. The brackets are to be connected to the transverse by double-riveted overlaps, and are to be attached to the centre line bulkhead by double angles, single riveted, having the same thickness as the transverse.

(*b*) The brackets attaching the upper deck transverses in the summer tanks to the expansion trunk side are to have the same thickness as the transverses; the length of the

arms of the brackets measured from the deck and from the side of the expansion trunk is to be twice the depth of the transverse. The brackets are to be double riveted to the transverses and are to be attached to the side of the expansion trunk by double angles, single riveted, having the same thickness as the transverse.

(*c*) The dimensions of the brackets attaching the second deck transverses to the webs on the centre line bulkhead are to be the same as the corresponding brackets at the ship's side. The brackets on the side of the centre line bulkhead opposite to the vertical web are to have the same dimensions, measured from the deck and bulkhead, as required for the brackets on the same side of the bulkhead as the vertical web.

The brackets are to be connected to the bulkhead by angles of the same scantlings and having the same number of rivets as are required for the corresponding bottom transverse bracket.

In all cases these attachment angles are to extend to the edge of the upper face bar on the deck transverse.

The brackets are to have the same thickness as the transverse and are to be flanged 5 inches on the edge. Where the length of the bracket along the edge exceeds 66 inches, stiffening angles, $3\frac{1}{2} \times 3$ inches, of the same thickness as the bracket, are to be fitted. Where the thickness of the bracket exceeds ·50 inch these angles are to be $3\frac{1}{2} \times 3\frac{1}{2}$ inches.

(*d*) Brackets are to be connected to transverses by double riveted overlaps. Where the brackets extend to the upper edge of the transverse, the overlap is to be treble riveted.

BOTTOM LONGITUDINALS.

Section 5. 1. **Scantlings.**—(*a*) The scantlings of the bottom longitudinals are determined by the depth of the vessel, the first longitudinal numeral, and the spacing of the transverses, and are given in **Tables 8** and **9**.

(*b*) The longitudinals are to be spaced 30 inches apart.

(*c*) Where the length of the vessel exceeds 400 feet, additional back bars are to be fitted, attaching the bottom longitudinals to the shell plating on each side of the transverse bulkheads for a distance of about 40 per cent of the spacing of the transverses, measured from the bulkhead.

2. **Intercostal Girder.**—(*a*) Where the breadth of the vessel exceeds 60 feet, an intercostal girder of the same depth as the transverses is to be fitted, having a thickness ·04 inch less than the bottom transverse, and having double angles, $3\frac{1}{2} \times 3\frac{1}{2}$ inches, on its upper edge.

(*b*) The girder plate is to be stiffened by one vertical angle where the spacing of the transverses is not greater than 10 feet, and by two equally spaced angles where this spacing is exceeded.

3. **Attachment to Bulkheads.**—(*a*) The longitudinals are to be cut at the bulkheads, to which they are to be attached by brackets having the dimensions and number of rivets given in **Table 13.**

(*b*) The brackets are to be attached to the bulkhead by single angles having the same thickness as the bracket plate. Where the angles are extended on account of the omission of a horizontal stiffener on the bulkhead the requirements of **Section 11, clause 4** (*d*), are to be complied with.

(*c*) The intercostal girder is to be attached to the bulkhead by a single angle, double riveted, which is to extend 6 inches above the upper edge of the girder.

4. **Attachment to Transverses.**—(*a*) The longitudinals are to be attached to the transverses by angles as required by **Section 2, clause 4.**

(*b*) The intercostal girder is to be attached to the transverses by a single angle, double riveted, and a plate strap is to be fitted, connecting the face bars of the girder and the face bar of the transverse.

SIDE LONGITUDINALS.

Section 6. 1. **Scantlings.**—(*a*) The scantlings of the side longitudinals are determined by the spacing of the transverses, the first longitudinal numeral, and by the depth of the longitudinal below the upper deck. These are given in **Tables 10** and **11.**

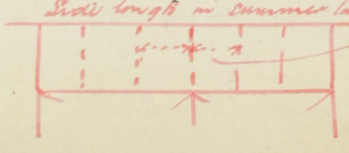
(*b*) The longitudinals are to be spaced 30 inches apart below the second deck, but in 'tween decks of standard height only two longitudinals are required.

(*c*) The scantlings of the longitudinals at the bilge are to be graduated between those required for side longitudinals and bottom longitudinals.

2. **Attachments to Bulkheads.**—(*a*) The longitudinals are to be cut at the bulkheads to which they are to be attached by brackets having the dimensions and number of rivets given in **Table 13.**

The thickness of the brackets in the 'tween decks need not exceed ·40 inch.

(*b*) Where the brackets are not attached to the horizontal stiffeners on the bulkhead, they are to be connected to the bulkhead by single angles having the same thickness as the bracket plate.



3. **Attachments to Transverses.**—(*a*) The longitudinals are to be attached to the transverses by angles as required by **Section 3, clauses 4** and **5.**

DECK LONGITUDINALS.

Section 7. 1. **Scantlings.**—(*a*) The scantlings of the longitudinals at the upper and second decks are given in **Tables 14** and **15.**

(*b*) The longitudinals are to be spaced 30 inches apart.

2. **Attachments to Bulkheads.**—(*a*) The longitudinals are to be cut at the bulkheads to which they are to be attached by brackets having the dimensions given in **Table 16.**

(*b*) The brackets are to be attached to the bulkhead by single angles, single riveted, having the same thickness as the bracket plates.

(*c*) The number and diameter of the rivets in each arm of the brackets are to be as given in **Table 16.**

3. **Attachments to Transverses.**—The longitudinals are to be attached to the transverses by angles, as required by **Section 4.**

BRACKET DETAILS.

Section 8. 1. **Flanging.**—(*a*) All hold brackets connecting the bottom and side longitudinals to the bulkheads are to be flanged.

(*b*) All other brackets which have 10 or more rivets in either arm are to be flanged.

(*c*) Bracket plates in cofferdams are to be flanged where the brackets to the adjacent longitudinals outside the cofferdams are flanged.

2. **Attachment Angles.**—(*a*) The angles attaching bracket plates to the bulkheads are to extend for at least 6 inches beyond the ends of the bracket arms.

(*b*) The bracket plates and angles are to be kept sufficiently clear of the bulkhead boundary bars to permit efficient caulking.

3. **General.**—Where transverse and centre line bulkheads intersect, a bracket is to be fitted in each corner of the intersection in way of each line of longitudinals.

SHELL PLATING.

Section 9. 1. **General.**—(*a*) The thickness of the shell plating in way of the longitudinal framing is given in **Table 17.**

(*b*) The number of end laps of the shell plating should be reduced as much as possible over the midship part of the vessel, and are, as far as practicable, to be kept well clear of the oil-tight bulkheads.

(*c*) Where transverse framing is adopted at the ends of the vessel the thickness of the plating is to be suitably increased.

(*d*) The edges of the plating are not to be joggled.

2. **Strengthening at ends of Poops and Bridges.**—(*a*) The thickness of the upper deck sheerstrake at the ends of the bridge, and at the front of the poop, is to be 20 per cent. greater than the Rule midship thickness.

(*b*) The bridge side plating is to extend beyond the ends of the bridge, and is to be supported by web plates spaced not more than 5 feet from the ends of the bridge. The bulwark rail is to be connected to the bridge end bulkheads by substantial bracket plates, and similar bracket plates are to be fitted on the inner side of the bulkhead.

Similar arrangements are to be provided at the front of the poop.

DECKS.

Section 10. 1. **Deck Plating.**—(*a*) The thickness of the plating is given in **Tables 18** and **19.**

(*b*) The thicknesses of the upper deck plating given in the Tables assume one deck opening 4 feet in breadth on each side of the vessel. Where the breadth of the openings is greater or less than 4 feet, the thickness of the deck plating is to be adjusted in order to provide the same sectional area of material.

The midship thickness of the plating is to be carried to the poop, and is to be extended into the poop for a distance at least equal to one-third the breadth of the vessel.

(*c*) The number of end laps of the deck plating should be reduced as far as practicable over the midship part of the vessel.

2. **Stringer Plates.**—(*a*) Deck stringer plates of the dimensions given in **Tables 18** and **19** are to be fitted, and are to be attached to the shell plating by angles of the size given in **Tables 19** and **20.**

The midship thickness of the upper deck stringer plate is to be carried aft as prescribed for the deck plating.

(*b*) The thickness of the upper deck stringer plate at the ends of the bridge, and at the front of the poop, is to be 20 per cent. greater than the Rule midship thickness.

3. **Continuity of Strength.**—(*a*) The second deck is to be fitted continuously and is to be carried through the cofferdams.

(*b*) The corners of deck openings are to be well rounded.

(*c*) The notching of upper deck stringer angles for scuppers should be avoided as far as practicable.

TRANSVERSE BULKHEADS.

Section 11. 1. **Plating.**—(*a*) The thickness of the plating is given in **Table 22.**

(*b*) The lowest strake is to be ·04 inch thicker than required by the Table. The lowest horizontal seam is to be kept above the attachment bars of the brackets to the bottom longitudinals.

2. **Vertical Webs below the Second Deck.**—(*a*) The scantlings of the webs are determined by the spacing, the length of the web and the height of the upper deck above the top of the web, and are given in **Table 24.**

The length of the web is to be taken from the second deck to the upper edge of the bottom longitudinal.

The spacing to be used in determining the scantlings is to be one-quarter the breadth of the vessel, where only one web is fitted.

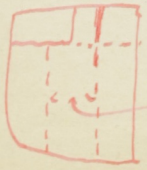
The spacing to be used where two webs are fitted is one-half the distance between the adjacent web and the ship's side or centre line bulkhead. Where three webs are fitted on each side the spacing of the centre web is to be taken as half the distance between the adjacent webs, plus one foot.

(*b*) The face bar is to extend from the deck longitudinal or other bar to the bottom longitudinal.

(*c*) Lightening holes not exceeding 6 inches diameter may be cut in the webs as close to the bulkhead angle as possible, and are to be fitted midway between the notches for the horizontal stiffeners.

(*d*) Notches cut in the webs for the horizontal stiffeners are to be well rounded at the corners and are not to be rough punched.

(*e*) The brackets at the top and bottom are to have a depth equal to 20 per cent of the length of the web.



The breadth of the brackets is to be not less than 30 inches, measured from the inner edge of the web, except at the shelf plate, where it is to extend to the inner edge of the shelf plate.

(*f*) The thickness of the top bracket is to be the same as, and the thickness of the lower bracket is to be ·04 inch greater than, the thickness of the web. The brackets are to be flanged 5 inches on the edge.

(*g*) The brackets are to be attached by double riveted overlaps to the web plate, and the web plate and brackets are to be attached to the longitudinals or girders at the deck and bottom by double riveted overlaps. Where the bracket forms part of the web, the butts of the plates are to be treble riveted.

The web plates and brackets are to be attached to the shelf plate by double angles, double riveted, which are to have the same thickness as the web plate.

(*h*) The webs are to be attached to the bulkhead by a single angle double riveted, which is to have the same thickness as the web. Where the moulded depth of the vessel does not exceed 23 feet this angle may be single riveted.

(*i*) A supporting bracket extending to the edge of the face bar is to be fitted to the web plate at about the middle of the span.

(*j*) The horizontal stiffeners are to be attached to the vertical web by stiffening angle bars, which are to extend from the bulkhead to the inner edge of the face bar on the web and to half the depth of the web alternately, but not less than six inches beyond the edge of the horizontal stiffeners. In way of the bracket at the bottom of the web all these angles are to extend to the inner edge of the face bar.

Where the depth of the vertical web does not exceed 20 inches all the stiffening angles are to extend to the inner edge of the face bar.

Above the supporting bracket the long and short stiffening angles are to have scantlings in proportion to the depth of the web, as prescribed by **Table 3** for side transverses, while below the supporting bracket all the stiffening angles are to have the scantlings prescribed for long stiffening angles.

(*k*) The number and diameter of the rivets in the angles connecting the horizontal stiffeners to the vertical web are to be in proportion to the depth of the horizontal stiffener, in accordance with **Table 12,** but the diameter of the rivets in the short stiffening angles is to be the same as required for the rivets in the long stiffening angles.

3. **Vertical Webs in Expansion Trunk.**—(*a*) The scantlings of the webs in the expansion trunks are given in **Table 25.**

(*b*) The lengths of the arms of the brackets at the top and bottom are to be the same as the breadth of the web plate, measured clear of the web or deck longitudinal.

(*c*) The brackets are to be double riveted in each arm.

(*d*) The webs are to be attached to the bulkhead by single angles, single riveted in 'tween decks of standard height.

(*e*) The horizontal stiffeners are to be attached to the web by stiffening angles extending the full depth of the web. These angles are to have flanges of the same dimensions and number of rivets as required for short stiffening angles, by **Tables 3** and **12**, but the thickness of these angles need not exceed the thickness of the web.

4. **Horizontal Stiffeners.**—(*a*) The horizontal stiffeners are to be spaced 30 inches apart.

The scantlings are to be determined by the span and by the depth below the upper deck at the middle line, and are given in **Table 26.** The span to be taken is that which gives the largest stiffener, whether the span is measured from the web to the ship's side, from the web to the centre line bulkhead, or from web to web.

(*b*) The horizontal stiffeners are to be connected to the side longitudinal and to the horizontal stiffeners on the centre line bulkhead by brackets.

The dimensions of the brackets and the number of rivets at the ship's side and centre line bulkhead are to be as required by **Section 6, clause 2.**

(*c*) The attachment of the horizontal stiffeners to the webs is to be in accordance with **clauses 2** and **3** above.

(*d*) The lowest horizontal stiffener is not to be more than 30 inches distant from the ends of the bracket plates connecting the bottom longitudinals to the bulkhead, and the distance between the stiffener and the ends of the bracket angles is not to exceed 12 inches.

5. **Shelf Plate.**—A horizontal shelf plate having the same thickness as the webs in the hold is to be fitted at the level of the second deck. The breadth of the shelf plate is to be $1\frac{3}{4}$ times the breadth of the vertical web below the second deck, but not less than 30 inches. The shelf plate is to be flanged 5 inches on the edge and is to be attached to the bulkhead by a single riveted angle. The attachment of the shelf plate to the centre line bulkhead and to the expansion trunk is to be double riveted.

6. **Bulkheads in Summer Tanks.**—(*a*) The horizontal stiffeners of the bulkheads in the Summer tanks are to be determined as for bulkheads in the expansion trunks from **Table 27.**

(*b*) Where vertical stiffeners are fitted, the scantlings are given in **Table 27.** The brackets attaching the lower ends of the vertical stiffeners to the second deck are to have the number of rivets given in the Table.

7. **Boundary Angles.**—(*a*) The bulkheads are to be attached to the shell plating, decks, expansion trunk, and centre line bulkhead by angles of the dimensions given in **Table 23.**

(*b*) The boundary angles are not to be joggled.

8. **Cofferdam Bulkheads.**—The cofferdam bulkheads are to be oil-tight and are to have the same thickness of plating, and the same connection to the shell plating and decks as required for the bulkheads of oil compartments.

The scantlings and spacing of the stiffeners are to be equivalent to those required for transverse oil-tight bulkheads.

CENTRE LINE BULKHEAD.

Section 12. 1. **General.**—(*a*) A centre line bulkhead is to be fitted throughout the oil compartments, pump room, and cofferdams, extending from the keel to the top of the expansion trunk. Beyond the cofferdams arrangements are to be made to avoid any abrupt termination of strength, by fitting webs and brackets.

(*b*) This bulkhead is to be oil-tight except in the pump rooms and cofferdams.

Where desired by the owners this requirement may be modified when a suitable notation will be made in the Register Book.

2. **Plating.**—(*a*) The thickness of the plating is given in **Table 22.**

(*b*) Where the moulded depth of the vessel exceeds 28 feet, the upper part of the bulkhead for a depth of 5 feet from the deck is to be increased by ·04 inch in thickness, and where the depth exceeds 42 feet by ·16 inch in thickness. For intermediate depths the increase in thickness is to be proportional.

The thickness of the strake next below is to be increased by half the amount specified above.

(*c*) The bottom strake is to be at least as broad as the lowest strake of the transverse bulkhead, and is to be ·04 inch thicker than required by the Tables.

3. **Vertical Webs below Second Deck.**—(*a*) The vertical webs on the bulkhead are to have the same scantlings and arrangements as the corresponding transverses at the ship's side, except that the thickness of the web plate may be ·06 inch less than the side transverse, with a minimum thickness of ·36 inch.

(*b*) The webs are to be attached to the bottom and deck transverses by brackets, which are to be flanged and are to have the same dimensions and scantlings as the brackets of the side transverses.

(*c*) The web plates are to be attached to the bulkhead by single angles, double riveted, which are to have the same thickness as the web.

(*d*) A supporting bracket extending to the edge of the face bar is to be fitted to the web plate at about the middle of the span.

(*e*) The horizontal stiffeners are to be attached to the vertical web by stiffening angles which are to extend from the bulkhead to the face bar of the web and to half the depth of the web alternately, but not less than 6 inches beyond the edge of the horizontal stiffeners. In way of the bracket to the bottom transverse all these angles are to extend to the edge of the bracket or face bar of the web.

Where the depth of the vertical web does not exceed 20 inches all the stiffening angles are to extend to the inner edge of the face bar.

Above the supporting bracket the short and long stiffening angles are to have scantlings in proportion to the depth of the web as prescribed by **Table 3** for side transverses, while below the supporting bracket these angles are to be of the scantlings prescribed for long stiffening angles.

(*f*) The number and diameter of the rivets in the angles connecting the horizontal stiffeners to the vertical web are to be in proportion to the depth of the horizontal stiffener in accordance with **Table 12**, but the diameter of the rivets in the short stiffening angles is to be the same as required for the long stiffening angles.

4. **Vertical Webs in Expansion Trunk.**—(*a*) The vertical webs in the expansion trunk are to have the scantlings given in **Table 28**.

(*b*) The web plate is to be connected to the second deck transverse by a double-riveted attachment and to the upper deck transverse as prescribed in **Section 4, clause 2**.

(*c*) The webs are to be attached to the bulkhead by single angles, single riveted.

(*d*) The horizontal stiffeners are to be attached to the web by stiffening angles extending to the edge of the web plate and 9 inches beyond the edge of the stiffener alternately. These angles are to have the same scantlings and number of rivets as required for the short stiffening angles of the vertical web below the second deck.

5. **Horizontal Stiffeners.**—(*a*) Horizontal stiffeners are to be fitted in line with the longitudinals at the ship's side and are to be spaced 30 inches apart, but only two longitudinals are required in 'tween decks of standard height.

(*b*) The scantlings are given in **Table 29** and are determined by the span and by the depth below the upper deck.

(*c*) The dimensions of the brackets and the number of rivets attaching the stiffeners to the transverse bulkheads are to be the same as required for the connection of the side longitudinals to the transverse bulkheads by **Section 6, clause 2**.

(*d*) The attachment of the horizontal stiffeners to the web plates is to be as required by **clauses 3** and **4** above.

6. **Boundary Angles.**—The bulkhead is to be attached to the keel plate by double angles, single riveted, of the dimensions given in **Table 21**, and to the upper deck by double angles of the size given in **Table 23**.

EXPANSION TRUNKS.

Section 13. 1. **Plating.**—(*a*) The expansion trunk sides are to be oil-tight throughout the oil compartments, and are to be carried through the cofferdams. They are to be arranged to form a continuation of the machinery casing at the after end, and are to be gradually tapered off at the forward end beyond the cofferdams.

(*b*) The thickness of the plating forming the sides of the expansion trunks is to be as given in **Table 19** for the plating of second decks.

(*c*) The plating is to be attached to the second deck by a double riveted angle of the size given in **Table 19** for second deck stringer angles, and to the upper deck by a single riveted angle of the size given in **Table 23** for attachment angles of bulkheads to upper deck.

2. **Vertical Webs.**—The scantlings and arrangements of the vertical webs are to be as required by **Section 12, clause 4**, for the vertical webs on the centre line bulkhead within the expansion trunk.

3. **Horizontal Stiffeners.**—The scantlings and arrangements of the horizontal stiffeners are to be as required by **Section 12, clause 5**, for the corresponding stiffeners on the centre line bulkhead within the expansion trunk.

INCREASED SPACING OF LONGITUDINALS.

Section 14. 1. **Increased Spacing.**—Where a spacing of longitudinals greater than 30 inches is desired, the scantlings generally are to be increased as specified in this Section.

2. **Longitudinals.**—The scantlings of the longitudinals at the shell and decks are to be increased to give equivalent strength to the requirements of the Tables.

3. **Shell Plating.**—The thickness of the bottom and side shell plating is to be increased ·02 inch for every 2 inch increase in spacing. The thickness of the sheerstrake and strake below need not be increased, but is to be at least equal to the increased thickness of side plating.

4. **Deck Plating.**—(*a*) The thickness of the upper deck plating is to be increased ·02 inch for every 4 inches increase in spacing.

(*b*) The thickness of the second deck plating is to be increased ·02 inch for every 4 inches increase in spacing.

5. **Bulkheads.**—The thickness of the bulkhead plating is to be increased ·02 inch for every 4 inches increase in the spacing of the stiffeners. The scantlings of the stiffeners are to be increased to give the equivalent strength to the requirements of the Tables.

6. **General.**—In cases in which increased spacing is adopted, such local increases in scantlings are to be made as may be considered necessary.

OIL FUEL FOR SHIP'S USE IN SUMMER TANKS.

Section 15. 1. **General.**—Where it is proposed to carry oil fuel in the summer tanks for the use of the ship, the following additional requirements are to be complied with.

2. **Length of Tanks.**—The length of the tanks is not to exceed 60 feet.

3. **Wash Bulkheads.**—Wash bulkheads, which may have suitable lightening holes, are to be fitted not further apart than 30 feet.

HATCHWAYS.

Section 16. 1. **General.**—(*a*) Hatchways should not be larger or more numerous than is necessary to provide reasonable access to all compartments; as far as practicable they are not to be situated in the same transverse plane.

(*b*) The corners of all hatchways are to be well rounded.

(*c*) The hatchway covers are to be oiltight.

(*d*) The requirements of **Section 22, clause 1** (*c*), are to be complied with.

2. **Coamings.**—(*a*) The coaming plates are to be ·40 inch thick, and the butts may be single riveted. The coaming may be attached to the deck plating by a single-riveted angle.

(*b*) Where the length or breadth of a hatchway exceeds 4 feet, and the height of the coaming is greater than 2 feet 6 inches, a vertical stiffener is to be fitted to the coaming, and the upper edge of the coaming is to be suitably stiffened.

3. **Covers.**—(*a*) Where the area of the hatchway does not exceed 10 square feet, the thickness of the cover is to be ·50 inch.

Where the area exceeds 10 square feet but is not greater than 25 square feet, the cover is to be ·60 inch in thickness, or may be ·50 inch if stiffened by 4 × 3 × ·40 inch angles spaced 2 feet apart.

If the area exceeds 25 square feet, the thickness of the covers is to be ·50 inch with stiffeners 5 × 3 × ·40 inch angles spaced 2 feet apart.

(*b*) The covers are to be secured by fastenings spaced not further apart than 15 inches along the sides and ends and not more than 9 inches from each corner.

STRUCTURAL ARRANGEMENTS OUTSIDE OIL COMPARTMENTS.

Section 17. 1. **General.**—(*a*) The structure forward and abaft the oil tanks, pump rooms, cofferdams and oil fuel bunkers may be framed either on the longitudinal or transverse system, or combination thereof.

(*b*) Where the longitudinal system is adopted special strengthening is to be provided in the machinery space, peaks, oil fuel and ballast tanks, bottom forward and in way of the panting arrangements.

(*c*) Where the transverse system is adopted, the arrangements are to embody such special strengthening as may be considered necessary.

2. **Continuity of Strength.**—Special care is to be taken to ensure continuity of strength at any junction of transverse and longitudinal framing.

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of the longitudinal below the upper deck exceeds 25 feet, the spacing adjacent to the transverses and bulkheads for the number of rivets described above is to be 3½ diameters; the spacing elsewhere may be 6 diameters.

(*b*) The number of rivets attaching the longitudinals to the horizontal stiffening angles on the transverses is to be as required by **Table 12.**

Where the product of the length of the vessel in feet and the spacing of the transverses in feet does not exceed 3,000, the rivet spacing may be 5 diameters.

4. **Side Transverses.**—(*a*) The angles attaching the hold transverse to the shell are to have two or three complete rows of rivets as specified in **Section 3, clause 3.**

The spacing of the rivets is to be 4½ diameters.

Where an additional back bar is required to be fitted by **Section 3, clause 3** (*b*), the spacing of the rivets may be 5 diameters.

7. **Centre Line Bulkhead.**—(*a*) The end laps of the bulkhead plating are to be double riveted with the exception of the bottom strake, the end laps of which are to be treble riveted.

INCREASED SPACING OF LONGITUD

Section 14. 1. **Increased Spacing.**—spacing of longitudinals greater than 30 inches the scantlings generally are to be increased as this Section.

2. **Longitudinals.**—The scantlings of the l at the shell and decks are to be increased to giv strength to the requirements of the Tables.

3. **Shell Plating.**—The thickness of the side shell plating is to be increased ·02 inch for increase in spacing. The thickness of the shee strake below need not be increased, but is to equal to the increased thickness of side plating.

4. **Deck Plating.**—(*a*) The thickness of th plating is to be increased ·02 inch for every 4 inc in spacing.

(*b*) The thickness of the second deck plat increased ·02 inch for every 4 inches increase in

5. **Bulkheads.**—The thickness of the bulk is to be increased ·02 inch for every 4 inches in spacing of the stiffeners. The scantlings of t are to be increased to give the equivalent stre requirements of the Tables.

6. **General.**—In cases in which increase adopted, such local increases in scantlings are t may be considered necessary.

OIL FUEL FOR SHIP'S USE IN SUMME

Section 15. 1. **General.**—Where it is carry oil fuel in the summer tanks for the use the following additional requirements are to with.

2. **Length of Tanks.**—The length of the to exceed 60 feet.

3. **Wash Bulkheads.**—Wash bulkheads, which may have suitable lightening holes, are to be fitted not further apart than 30 feet.

HATCHWAYS.

Section 16. 1. **General.**—(*a*) Hatchways should not be larger or more numerous than is necessary to provide reasonable access to all compartments; as far as practicable they are not to be situated in the same transverse plane.

(*b*) The corners of all hatchways are to be well rounded.

(*b*) Where the longitudinal system is adopted special strengthening is to be provided in the machinery space, peaks, oil fuel and ballast tanks, bottom forward and in way of the panting arrangements.

(*c*) Where the transverse system is adopted, the arrangements are to embody such special strengthening as may be considered necessary.

2. **Continuity of Strength.**—Special care is to be taken to ensure continuity of strength at any junction of transverse and longitudinal framing.

RIVETING.

Section 18. 1. **Shell Plating.**—(*a*) The riveting of the end laps of the shell plating is to be as required by **Table 30.**

(*b*) The seams are not to be less than double riveted.

In vessels above 450 feet, and not exceeding 475 feet in length, the rivets in the seams of side plating are to be spaced $3\frac{1}{2}$ diameters apart between the peak bulkheads. Where the length exceeds 475 feet, but is not greater than 500 feet, three seams of side plating are to be treble riveted between the peak bulkheads, with rivets spaced 4 diameters apart. In vessels from 500 to 525 feet in length three seams, and in vessels from 525 to 550 feet in length four seams are to be treble riveted, with rivets spaced $3\frac{1}{2}$ diameters apart.

2. **Decks.**—(*a*) The riveting of the end laps of the deck stringers and plating is to be as required by **Table 30.**

(*b*) The seams of the plating are to be double riveted.

(*c*) The flanges of the upper deck stringer angles, of the second deck stringer angle, and of the angles attaching the sides of the expansion trunk to the second deck, are to be double riveted.

(*d*) The rivets attaching the transverses to the deck are to be spaced 5 diameters apart.

(*e*) The rivets attaching the longitudinals to the deck are to be spaced 6 diameters apart.

3. **Bottom Transverses.**—The angles attaching the transverses to the shell are to have two or three complete rows of rivets as specified in **Section 2, clause 3.**

The spacing of the rivets is to be $4\frac{1}{2}$ diameters.

Where an additional back bar is required to be fitted by **Section 2, clause 3** (*b*), the spacing of the rivets may be 5 diameters.

Where the product of the length of the vessel in feet and the spacing of the transverses in feet does not exceed 3,000, the rivet spacing may be 5 diameters.

4. **Side Transverses.**—(*a*) The angles attaching the hold transverse to the shell are to have two or three complete rows of rivets as specified in **Section 3, clause 3.**

The spacing of the rivets is to be $4\frac{1}{2}$ diameters.

Where an additional back bar is required to be fitted by **Section 3, clause 3** (*b*), the spacing of the rivets may be 5 diameters.

Where the product of the length of the vessel in feet and the spacing of the transverses in feet does not exceed 3,000, the rivet spacing may be 5 diameters.

(*b*) The spacing of the rivets through the shell in the 'tween decks is to be as required in the holds.

5. **Bottom Longitudinals.**—(*a*) Where the product of the length of the vessel in feet and the spacing of the transverses in feet does not exceed 3,000, the rivets through the longitudinals and shell plating are to be spaced $4\frac{1}{2}$ diameters apart for a number of rivets on each side of the transverse or bulkhead equal to the spacing of the transverses in feet, and the spacing elsewhere may be 6 diameters.

Where the product exceeds 3,000, the spacing adjacent to the transverse and bulkheads for the number of rivets described above is to be $3\frac{1}{2}$ diameters; the spacing elsewhere may be 6 diameters.

(*b*) In the foremost oil compartment the spacing is to be $4\frac{1}{2}$ diameters throughout.

(*c*) The number of rivets attaching the longitudinals to the vertical stiffening angles on the transverses is to be as required by **Table 12.**

(*d*) The spacing of the rivets in the vertical flange of the shell angle of built longitudinals is to be the same as required through the longitudinals and the shell plating.

6. **Side Longitudinals.**—(*a*) Where the distance of the longitudinal below the upper deck does not exceed 15 feet, the rivets attaching the longitudinals to the shell are to be spaced 6 diameters apart.

Where the distance below the upper deck exceeds 15 feet, but is not greater than 25 feet, the rivets are to be spaced $4\frac{1}{2}$ diameters apart for a number of rivets on each side of the transverse or bulkhead equal to the spacing of the transverses in feet; the spacing elsewhere may be 6 diameters.

Where the distance of the longitudinal below the upper deck exceeds 25 feet, the spacing adjacent to the transverses and bulkheads for the number of rivets described above is to be $3\frac{1}{2}$ diameters; the spacing elsewhere may be 6 diameters.

(*b*) The number of rivets attaching the longitudinals to the horizontal stiffening angles on the transverses is to be as required by **Table 12.**

7. **Centre Line Bulkhead.**—(*a*) The end laps of the bulkhead plating are to be double riveted with the exception of the bottom strake, the end laps of which are to be treble riveted.

The seams are to be double riveted.

(*b*) Where the product of the length of the vessel, in feet, and the spacing of the transverses, in feet, does not exceed 3,000, the rivets attaching the vertical webs to the bulkhead are to be $\frac{3}{4}$ inch diameter, spaced 5 diameters apart. Where this product exceeds 3,000, but does not exceed 4,000, the rivets are to be $\frac{3}{4}$ inch diameter, spaced $4\frac{1}{2}$ diameters apart. Where this product exceeds 4,000, the rivets are to be $\frac{7}{8}$ inch diameter, spaced $4\frac{1}{2}$ diameters apart.

(*c*) Where the distance of the horizontal stiffeners below the upper deck at side is not greater than 15 feet, the rivets attaching the stiffeners to the bulkhead are to be spaced 6 diameters apart.

Where the distance of the horizontal stiffeners below the upper deck at side exceeds 15 feet and is not greater than 25 feet, the rivets are to be spaced $4\frac{1}{2}$ diameters apart for a number of rivets on each side of the transverse or bulkhead equal to the spacing of the transverses in feet; the spacing elsewhere may be 6 diameters.

Where the stiffeners are at a greater distance below the upper deck at side than 25 feet, the rivets are to be spaced $3\frac{1}{2}$ diameters apart for a number of rivets on each side of the transverse or bulkhead equal to the spacing of the transverses in feet; the spacing elsewhere may be 6 diameters.

8. **Expansion Trunks.**—(*a*) The seams and end laps of the side plating are to be double riveted.

(*b*) The rivet attachment of the web plates to the trunk side plating is to be the same as required for the attachment of vertical webs to the centre line bulkhead.

(*c*) The rivets connecting the horizontal stiffeners to the trunk side plating are to be spaced 6 diameters apart.

9. **Transverse Bulkheads.**—(*a*) The end laps and seams of the bulkhead plating are to be double riveted.

(*b*) Where the depth of the vessel does not exceed 25 feet the rivets attaching the vertical webs to the bulkhead are to be $\frac{3}{4}$ inch in diameter, spaced $4\frac{1}{2}$ diameters apart. Where this depth is exceeded the rivets are to be $\frac{7}{8}$ inch, spaced $4\frac{1}{2}$ diameters.

(*c*) Where the distance of the horizontal stiffeners below the top of the expansion trunk at the middle line does not exceed 18 feet, the rivets attaching the horizontals to the bulkhead are to be spaced 6 diameters apart. For stiffeners at a greater distance below the top of the trunk the rivets are to be spaced 5 diameters apart.

10. **Spacing of Rivets.**—The rivets in the various parts of the structure are to be spaced as follows, centre to centre :—

$3\frac{1}{2}$ diam.	End laps of keel plates, shell plating and deck stringer plates except quadruple and quintuple end laps.	
	Seams of shell plating, seams and end laps of deck plating, plating of centre line and transverse bulkheads and expansion trunk sides.	Where thickness of plating does not exceed ·50 inch.
4 diam.	Quadruple riveted end laps of keel plates, shell plating and deck stringer plates.	
	Seams of shell plating, seams and end laps of deck plating, plating of centre line and transverse bulkheads and expansion trunk sides.	Where thickness of plating exceeds ·50 inch.
$4\frac{1}{2}$ diam.	Quintuple-riveted end laps of shell plating and deck stringer plates.	
5 diam.	Boundary angles of bulkheads, keel angles, deck stringer angles and angles at upper and lower corners of expansion trunks, bracket plate attachments of transverses and web plates, laps of transverses and webs.	
6 diam.	Face bars on transverses and webs and built longitudinals.	

11. **General.**—(*a*) Wherever the transverses, web plates, longitudinals and stiffeners cross seams and butts, there are to be, in general, the same number of rivets through these members as are required for the seams and end laps.

(*b*) In all cases where double riveted angles are required, two complete rows of rivets are to be fitted.

WORKMANSHIP.

Section 19. 1. **General.**—(*a*) The workmanship throughout is to be of the highest character and is to be submitted to the closest inspection.

(*b*) Notches cut in transverses and webs for longitudinals are to be well rounded at the corners and are not to be rough punched.

(*c*) Lightening holes in transverses and webs are to be limited in size and position as specified throughout the Rules.

2. **Riveting.**—(*a*) Particular attention is to be paid to the efficiency of the riveting, and the points of the rivets are to be left full. In all oil-tight surfaces such as shell plating, decks, bulkheads, bulkhead boundary and connection angles, expansion trunks and stringer angles, the rivet holes are to be countersunk.

(*b*) Special care is to be taken in the punching and countersinking of the holes and the fitting together of the various parts. Where any unfairness exists in the holes they are to be rimered, not drifted, and larger rivets used in the rimered holes. The burr caused by punching and all drillings and rimerings are to be removed before the different parts are screwed together for riveting.

(*c*) Before the riveting of oil-tight surfaces is commenced the work is to be efficiently closed with nuts and screw bolts.

4. **Caulking.**—(*a*) Caulking is to be carefully and thoroughly executed.

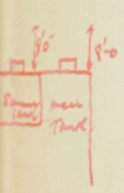
(*b*) All oil-tight joints are to have the surfaces of the steel plates fitted close to each other and to be caulked, as far as practicable, without the use of packing.

(*c*) Where the boundary bars of oil-tight bulkheads consist of double angles, both flanges of each bar are to be caulked.

5. **Angles.**—In oil-tight work shoe pieces are to be fitted at all corners.

TESTING OF COMPARTMENTS.

Section 20. 1. **General.**—Each oil compartment is to be filled separately with water and tested by pressure either before the vessel is launched or in dry dock.



2. **Test Head.**—The test pressure is to be obtained by means of a head of water eight feet above the highest point of the expansion trunk or the deck in the case of summer tanks.

3. **Cofferdams.**—Cofferdams are to be tested by being filled with water to the top of the hatchway.

4. **Special Surveys.**—At all Special Surveys each oil compartment and cofferdam is to be tested by being filled with water to the top of the hatchway in the expansion trunk and cofferdam.

PUMPING ARRANGEMENTS.

Section 21. 1. **Oil Pumps.**—(*a*) A complete system of piping and pumps is to be fitted for dealing with the oil cargo.

(*b*) Oil pump rooms are to be enclosed by oil-tight bulkheads and are to have no direct communications with the machinery space.

(*c*) Oil pumps fitted for the purpose of filling or emptying the oil compartments are to be kept entirely separate from the pumps fitted for filling or clearing the water ballast compartments of water.

2. **Water Ballast.**—(*a*) The water ballast pipes are not to pass through the oil compartments nor the pipes for the oil through any water ballast space.

(*b*) A separate ballast pump is to be fitted forward of the oil compartments for the purpose of filling and emptying the forward ballast tanks.

3. **General.**—(*a*) Efficient arrangements are to be provided for draining the 'tween deck spaces.

(*b*) Sounding pipes are to be fitted in the cofferdams.

VENTILATION.

Section 22. 1. **Oil Compartments.**—(*a*) Efficient means are to be provided for clearing dangerous gases from the tanks and cofferdams.

(*b*) Suitable arrangements are to be provided to prevent the accumulation of gas in pockets.

(*c*) A screw plug not less than 6 inches diameter or a 6 inch diameter sidelight is to be fitted to each hatchway cover and a gas cock is to be fitted on the coaming.

2. **Other Compartments.**—Efficient means of ventilation are to be provided for pump rooms, cofferdams, deck houses, and other enclosed spaces.

ELECTRIC LIGHTING.

Section 23. 1. **General.**—The special requirements contained in **Section 13** of the **Rules for Electric Fittings** are to be complied with.

PERIODICAL SURVEYS.

Section 24. 1. **Preparation of Tanks.**—At all special surveys the tanks are to be cleaned out and thoroughly cleared of gas. Every precaution is to be taken to ensure safety during inspection.

2. **Testing.**—Each oil compartment and cofferdam is to be tested by being filled with water to the top of the hatchway in the expansion trunk or cofferdam.

By order of the Committee,

ANDREW SCOTT,

Secretary.

71, FENCHURCH STREET, LONDON, E.C.3.

5th March, 1925.

TENTATIVE REGULATIONS FOR THE APPLICATION OF ELECTRIC ARC WELDING TO SHIP CONSTRUCTION.

GENERAL.

Section 1. 1. **Notation in Register Book.**—The following Provisional Rules have been adopted as a tentative measure for the classification in Lloyd's Register Book of vessels electrically welded, subject to the notations "Experimental" and "Electrically welded."

2. **Compliance with Regulations.**—The approval of the Society will be given to any system of welding which complies with these Regulations and consideration will be given to any alternative constructional arrangements which may be submitted for approval.

SYSTEM OF WELDING AND WORKMANSHIP.

Section 2. 1. **System of Welding.**—The system of welding proposed to be used is to be approved and comply with the regulations and tests laid down by the Committee.

2. **Manufacture of Electrodes.**—(*a*) The process of manufacture of the electrodes is to be such as to ensure reliability and uniformity in the finished article.

(*b*) Alterations from the process approved for the manufacture of electrodes are not to be made without the consent of the Committee.

3. **Specimens of Electrodes.**—Specimens of the finished electrodes, together with specifications of the nature of the electrodes, are to be supplied for purposes of record.

4. **Facilities for Inspection.**—The Society's Surveyors are to have access to the Works where the electrodes are manufactured, and will investigate, from time to time as may be necessary, the process of manufacture to ensure that the electrodes are identical with the approved specimens.

5. **Welding Operation.**—(*a*) The regulations for the voltage and amperage to be used with each size of electrode, and for the size of electrode to be employed with different thicknesses of material to be joined, are to be approved by the Committee.

(*b*) The Committee are to be satisfied that the operators engaged are specially trained, and are experienced and efficient in the use of the welding system proposed to be employed.

(*c*) Efficient supervisors of proved ability are to be provided, and the proportion of supervisors to welders is to be submitted for approval.

DETAILS OF CONSTRUCTION.

Section 3. 1. **General.**—The details of construction of the vessel and of the welds are to be submitted for approval.

2. **Procedure before Welding.**—Before welding, the surfaces to be joined are to be fitted close to each other and the methods to be adopted for this purpose are to be approved.

3. **Connections.**—(*a*) All butt and edge connections are to be lapped or strapped.

(*b*) With lapped connections the breadths of overlaps of butts and seams and the profiles of the welds are to be in accordance with the following table :—

Thickness of plate. Inches.	Width of overlap seam and butt. Inches.	Throat thickness of weld. Inches.
·40 and under	$2\frac{1}{4}$	·28
·60	$2\frac{1}{2}$	·38
·80	$2\frac{3}{4}$	·48
1·00	3	·50

(*c*) Intermediate values may be obtained by direct interpolation, and for thicknesses below ·40 inch the throat thickness is to be about 70 per cent. of the thickness of the plate.

4. **Definition of Terms.**—(*a*) A "full weld" extends from the edge of a plate for a distance equal to the thickness of plate to be attached, and the minimum measurement from the inner edge of plate to the surface of weld is the throat thickness given in the Table above.

(*b*) A "light closing weld" is a single run of light welding worked continuously along the edge of the plate. Such a weld may, however, be interrupted where it crosses the connection of another member of the structure.

(*c*) An "intermittent or tack weld" has short lengths of weld which are spaced three times the length of the weld from centre to centre of each short length of weld. Such tack welding may vary in amount of weld between a "full weld" and a "light closing weld."

5. **Nature of Welds.**—The general character of welds is to be in accordance with the following table:—

	Inside edge.	Outside edge.
(*a*) Butts of shell, deck and inner bottom plating ...	Full weld.	Full weld.
(*b*) Butts of longitudinal girders and hatch coamings		
(*c*) Seams of shell, deck and inner bottom plating ...	Light weld.	Full weld.
(*d*) Butts and seams of bulkhead plating		

	Toe.	Heel.
(*e*) Frames to shell, reverse frames to frames and floors	Tack weld.	Light weld.
(*f*) Beams to decks ...		
(*g*) Longitudinal continuous angles		
(*h*) Side girders, bars to shell, intercostal plates, floors and inner bottom ...		
(*i*) Bulkhead stiffeners ...		

6. **Watertight Bars.**—All bars required to be watertight are to have continuous welding on both flanges with tack welding at heel of bar.

7. **Special Consideration.**—The welded connections of beam, frame and other brackets are to be submitted for special consideration.

8. **Additional Attachment.**—The Committee may require, when considered necessary, additional attachment beyond that specified above, and the welding of all other parts is to be to their approval.

By order of the Committee,

ANDREW SCOTT,

Secretary.

71, Fenchurch Street, London, E.C.3.

13*th July*, 1922.

The following firms having applied to have their systems of Electric Welding tested to ascertain whether they comply with the Tentative Regulations adopted by the Society, their applications have been complied with, and the Surveyors' reports found satisfactory by the Committee:—

La Soudare Electrique Autogene S.A. (Procedes Arcos).
The Alloy Welding Processes, Ltd.
The Blohm & Voss System.
The British Arc Welding Co., Ltd.
The Ferro-Arc Welding Co., Ltd.
The Kjellberg System.
The Premier Electric Welding Co., Ltd.
The Quasi-Arc Co., Ltd.
The Whitecross Company, Ltd. (Armco Ingot Iron Electrodes).
The Wilson Plastic Arc System.

By order of the Committee,

ANDREW SCOTT,

Secretary.

71, Fenchurch Street, London, E.C.3.

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RULES FOR THE CONSTRUCTION AND SURVEY OF ENGINES AND BOILERS OF STEAM VESSELS.

Section 1. In vessels propelled by steam engines, the materials used in the construction of the machinery and boilers are to comply with the **Rules for the Quality and Testing of Materials.** The machinery and boilers are to be inspected throughout, the boilers tested by hydraulic pressure, and the machinery tested under steam by the Society's Engineer-Surveyors, who will furnish a report to the Committee. If found satisfactory the Committee will thereupon grant a certificate, and insert in the Register Book the notification, "LMC" *in red* (*i.e.* "LLOYD'S MACHINERY CERTIFICATE"), indicating that the machinery and boilers are certified to be in good order and safe working condition.

Section 2. 1. In steam vessels built under Special Survey, the Machinery and Boilers must also be constructed under Special Survey.

2. In cases of machinery or new boilers being built under Special Survey, the distinguishing mark ✠ will be noted in red, thus: "✠LMC," or "✠NE & B," or "✠NB."

3. In order to facilitate this inspection, the plans of the machinery and boilers are to be examined, and from them the working pressure fixed.

4. Any novelty in the construction of the machinery or boilers is to be reported to the Committee.

5. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under steam; any defects, &c., to be pointed out as early as possible.

6. The Surveyors may also, if desired, compare the work as it progresses with the requirements of the specification agreed upon by the parties concerned, and certify to the conditions thereof, as far as can be seen, being satisfactorily complied with.

7. The machinery and boilers are to be securely fixed to the vessel to the satisfaction of the Surveyor.

Section 3. 1. **Feed Pumps.**—All steam vessels are to be provided with at least two entirely separate means of supplying the main boilers with feed water, when working at full power.

2. If the main feed supply is from pumps worked from the main engines, then with engines above 70NHP, there are to be two main feed pumps, so arranged that either can be shut off and overhauled while the other is at work. Each pump is to be capable of performing the whole work required.

3. In engines of 70NHP and under, and also in all engines of steam tugs and tenders, one main feed pump worked from the main engines will be approved, provided the auxiliary feed pump required by **clause 5** is fitted.

4. The main feed pumps may be worked by independent engines provided they are fitted with automatic regulators for controlling their speed. If only one such pump is fitted for the main feed the auxiliary feed pump required by **clause 5** is also to be fitted with an automatic speed regulator.

5. A power pump is to be provided as an auxiliary feed supply, capable of performing the whole work required of feeding the boilers at full power. This pump is to be fitted with suctions to the hotwell and to the sea. This pump may be also used for general purposes, but in this case the suction pipes to the hotwell and sea are to be entirely distinct from those to the bilges.

Section 4. 1. **Bilge and General Service Pumps.**—The engines are to be fitted with two bilge pumps so arranged that one can be overhauled whilst the other is at work.

2. In engines of 70NHP and under and also in engines of steam tugs and tenders, one bilge pump worked from the main engine will be sufficient, provided the power pump required by **clause 4** is fitted.

3. In lieu of bilge pumps worked from the main engines, a separate power pump may be fitted additional to that required by **clause 4.**

4. A power pump is to be provided connected to the main bilge system as required in **clause 5.**

5. (*a*) Each power bilge pump is to be arranged to draw water from any hold or machinery compartment of the vessel, except where manual pumps only are permissible.

(*b*) Each independent power pump is to be capable of giving a speed of water through the pipes of the largest diameter required by the formula in **Section 34, clause 9,** of the **Rules for Steel Vessels,** of not less than 400 feet per minute, under ordinary working conditions.

(*c*) At least one of the power pumps (clauses 3, 4) is to be fitted with a direct suction to the engine room, which can be used while the other bilge pumps are being used on other parts of the vessel (*see* Section 34, clause 3, paragraph (e).

(*d*) The bilge suctions in machinery spaces are to be led from easily accessible mud-boxes placed, where practicable, above the level of the working floor, with straight tail pipes to the bilges, and having covers secured in such a manner as to permit of them being expeditiously opened and closed. The suction ends in hold spaces are to be enclosed in strum-boxes having perforations not more than $\frac{3}{8}$ inch in diameter whose combined area is not less than twice that of the suction pipe, and the boxes are to be so constructed that they can be cleared without breaking any joint of the suction pipe. Suction pipes in tunnel wells are to have similar strum-boxes.

6. The main water circulating pumps are to be fitted with direct bilge suction connections, provided with non-return valves, to the lowest level in the machinery space and of a diameter at least two thirds that of the sea inlet.

7. One of the power pumps referred to in clauses 3 and 4 is to be fitted to draw from the sea and to deliver water on deck, and the arrangements are to be such that (except in the case of trawlers, tugs, yachts, and other small vessels) the water service can be used at both ends of the vessel at the same time.

Section 5. Twin Screw Vessels.—In vessels fitted with twin screw engines, the main feed pumps and the main engine bilge pumps may be fitted, one of each on each engine, provided they are so connected that each feed pump can deal with the water from both hotwells, and that each bilge pump can draw from all parts of the vessel.

Section 6. 1. Pipes, General.—All discharge pipes are to to be fitted with discharge valves, which are to be secured to the plating of the vessel in accessible positions.

2. Pipes which pass through coal bunkers are to be protected efficiently.

3. Lead pipes are neither to be used within coal bunkers nor are they to be attached to bunker bulkheads.

Section 7. 1. Steam Pipes.—In all steam pipes provision is to be made for expansion and contraction to take place without unduly straining the pipes. Where the provision for expansion is by means of bends in the pipes it is recommended that the various lengths of pipes should be made short of the designed lengths by amounts equal to half the calculated expansion at the temperature of the steam.

2. For the thicknesses and tests of copper, iron, or steel steam and other pipes see Section 13.

Section 8. Steam Turbine Engines.—In single screw vessels fitted with steam turbine engines the arrangements are to be such that steam can be led direct to the L.P. Turbine and either the H.P. or I.P. Turbine can exhaust direct to the condenser. Two turbines are to be fitted with astern wheels.

Section 9. Forced Lubrication.—In all vessels fitted with steam engines in which the lubricating oil is circulated under pressure, a spare oil pump is to be supplied with all connections ready for immediate use, and two independent means are to be arranged for circulating water through the oil cooler.

COCKS, PIPES, SEA CONNECTIONS AND PUMPING ARRANGEMENTS.

(*See also* Section 34 of the Rules for Steel Vessels.)

Section 10. 1. All sea cocks and valves required to be fitted on the plating of the vessel are to be fixed in easily accessible places above the level of the stokehold and engine room platforms, or are to be fitted on strong iron or steel stands of a height sufficient to lift them up to the level of these platforms.

2. The bolts securing all cocks or sea connections to the plating of the vessel are to be tapped into the plating of the vessel or fitted with countersunk heads.

3. The blow-off cocks on the plating of the vessel are to be fitted with spigots passing through the plating, and a brass or gun-metal ring on the outside. The cocks are to be so constructed that the key or spanner can only be taken off when the cock is shut. (*See* Section 19, clause 3.)

4. (*a*) The arrangement of pumps, valves and their connections are to be such as to prevent the possibility of water passing from the sea or from water tanks into the cargo or machinery spaces, or from one compartment to another. To effect this requirement, the bilge connection to any pump having also a suction from the sea should be made either by means of a non-return valve or a cock which cannot be open at the same time to the sea, or to water tanks and to the bilges. Valves in all bilge distribution boxes are to be of the non-return type.

(*b*) Cocks and valves connecting all bilge suction pipes are to be fixed in accessible places above the stokehold and engine room platforms.

(*c*) All pipes from the pumps which are required for draining cargo or machinery spaces are to be entirely distinct from pipes which may be used for filling or emptying spaces where water is carried.

RULES FOR SHAFTS.

Section 11. 1. General.—(*a*) All shafts are to be turned all over and are to be examined when rough turned and when finished.

(*b*) Gauges of an approved description for testing the truth of the crank shafts of Reciprocating Engines are to be supplied with all new engines, and adjusted in the presence of the Surveyor. Where Steam Turbine Engines are fitted, gauges for testing the truth of the rotor, pinion and gear wheel shafts are to be supplied, and adjusted in the presence of the Surveyor.

2. **Materials for Shafts.**—(*a*) Shafts may be forged from ingot steel, wrought iron bars piled, or scrap wrought iron, and they may be wrought by hammer, press or, where in straight lengths, by rolling mill.

(*b*) Mild steel scrap may be used for intermediate shafts but not for crank, thrust, tube or screw shafts.

(*c*) If scrap is used it must be of uniform quality and be thoroughly cleansed. A mixture of iron and steel scrap is not permitted in any case.

(*d*) Where ingot steel is used for shafts it is to comply generally with the requirements of **Section 10** of the **Rules for the Quality and Testing of Materials.**

(*e*) Where shafts are proposed to be made of ingot steel of other tensile strength than those specified in **Section 10** of the **Rules for the Quality and Testing of Materials**, the proposed limits of tensile strength and elongation should be submitted for consideration.

(*f*) Where ingot steel shafts are made by rolling and the couplings are formed from the shafts by upsetting, the test pieces may be cut from the outer edges of the couplings.

3. **Materials for Couplings.** — (*a*) Couplings of wrought iron shafts may be welded to the body of the shaft, but those of ingot steel shafts are to be forged from the solid or by upsetting the ends by hydraulic pressure.

(*b*) Couplings, where separate from the shaft, may be forged from ingot steel, wrought iron, or mild steel scrap; or they may be steel castings.

4. **Materials for Crank Shaft Webs.**—(*a*) Webs of built crank shafts may be forged or rolled from ingot steel, wrought iron, or mild steel scrap; or they may be steel castings.

(*b*) The material of cast steel webs is to be such that the tensile strength does not exceed 32 tons per square inch, and in no case is the sum of the tensile breaking strength in tons per square inch and the percentage of elongation, measured on a standard test piece, to be less than 50.

Section 12. 1. **Dimensions of Shafts.** — The dimensions of the shafts of steam engines are not to be less than those given by the following formulæ :—

2. **Steam Reciprocating Engines.**—(*a*) The diameter of the intermediate shafts is not to be less than that given by the following formula :—

Diameter of intermediate shaft, in inches=

$$\sqrt[3]{\frac{D^2 \times S \times WP}{C\,(r + 2)}}$$

where **D** is the diameter in inches of the low pressure cylinder or the equivalent diameter where two or more low pressure cylinders are fitted,

S is the stroke of the piston in inches,

WP is the working pressure in the boiler in lbs. per square inch,

r is the ratio of the areas of the low pressure cylinder or cylinders to that of the high pressure cylinder or cylinders,

C is a coefficient given in the following Table :—

COMPOUND, TRIPLE, OR QUADRUPLE EXPANSION RECIPROCATING ENGINES.	VALUES OF "C"	
	Ocean Going and Home Trade Vessels.	Vessels trading on Estuaries, Rivers, Lochs and Lakes.
2 cranks at 90° ...	1900	2100
2 cranks at 180° ...	1350	1500
3 cranks at 120° ...	2150	2400
4 cranks balanced ..	2150	2400
4 cranks at 90° ...	2100	2300

3. **Crank Shafts.**—The diameter of the crank shafts is not to be less than 1·05 times that required for the intermediate shaft.

4. **Crank Webs of Built Shafts.**—(*a*) The dimensions of the crank webs of built shafts are not to be less than those given by the following formulæ :—

$$h = \cdot 625 \times d$$

$$t = \sqrt{\frac{\cdot 12 \times d^3}{h}}$$

where h is the thickness of the web, measured parallel to the axis, in inches,

t is the thickness of metal around the eyeholes measured radially, in inches,

d is the diameter required for the crank shaft in inches.

(*b*) Crank webs are to be securely shrunk on the body pieces and crank pins, or to be forced on by hydraulic pressure. One or two keys or cylindrical dowels are to be fitted at the junction of the body pieces and webs.

On the application of Owners, the Committee will be prepared to give consideration to the circumstances of any special case.

5. **Thrust Shafts.**—The diameter at the collars of thrust shafts transmitting torque is not to be less than 1·05 times that required for the intermediate shaft. Thrust shafts may be tapered down outside the collars to the diameter required for the intermediate shaft.

6. **Tube Shafts** (Shafts passing through stern tubes but not carrying the screw propellers).—The diameter of the tube shaft is not to be less than 1·05 times that required for the intermediate shaft, and any part of the shaft within the tube which may be exposed to sea water is not to be less than 1·075 times that required for the intermediate shaft.

7. **Screw Shafts** (Shafts carrying the screw propellers).—(*a*) The diameter of the screw shaft is not to be less than that given by the following formula:—

$$\text{Diameter of screw shaft, in inches} = d + \frac{P}{C}$$

where d is the diameter required for the intermediate shafts, in inches.

P is the diameter of the propeller, in inches.

C = 144 when the shaft is fitted with a continuous liner, or

C = 100 when the shaft is not fitted with a continuous liner.

(*b*) Screw shafts which run in stern tubes may have the end forward of the stern gland tapered down to a diameter, at the coupling flange, of 1·05 times d.

8. **Bronze Liners on Shafts.**—(*a*) The thickness of liners fitted on screw shafts or on tube shafts, in way of the bushes, is not to be less than that given by the following formula:—

$$t = \frac{d + 9{\cdot}25}{32}$$

where t is the thickness of the liner, in inches.

d is the diameter required for the screw or tube shaft under the liner, in inches.

(*b*) The thickness of a continuous liner between the bushes is not to be less than $\frac{3}{4}$ t.

(*c*) Continuous liners should be cast in one piece or, if made of two or more lengths, the junctions of the separate pieces are to be made by fusion through the whole thickness of the liner.

(*d*) Liners are to be carefully shrunk on, or forced on to the shafts by hydraulic pressure. Pins are not to be used to secure the liners.

(*e*) If the liner does not fit tightly between the bearings in the stern tube, the space between the shaft and the liner is to be charged or forced with a plastic material insoluble in water and non-corrosive.

(*f*) Effective means are to be provided for preventing water from having access to the shaft at the part between the after end of the liner and the propeller boss.

9. **Stern bush.**—The length of the bearing in the stern bush next to and supporting the propeller is not to be less than four times the diameter required for the screw shaft under the liner.

10. **Couplings.**—(*a*) The diameter of the coupling bolts at the joining faces of the couplings is not to be less than that given by the following formula:—

$$\text{Diameter of coupling bolts, in inches} = \sqrt{\frac{d^3}{3{\cdot}5 \times n \times r}}$$

where d is the diameter required for the intermediate shafts, in inches,

n is the number of bolts in the coupling,

r is the radius of the pitch circle of the bolts, in inches.

(*b*) The thickness of the coupling flanges at the pitch circle of the bolt holes is not to be less than the diameter of the coupling bolts at the face of the coupling. The thickness of the screw shaft coupling flange is not to be less than 0·25 of the diameter required for the intermediate shaft.

(*c*) The radius of curvature at the fillet where the flange starts from the shaft should not be less than ·125 the diameter of the shaft adjacent to the flange.

(*d*) Where couplings are separate from the shafts provision is to be made to resist the astern pull.

11. **Steam Turbine Engines.**—The diameter of the intermediate shafts is not to be less than that given by the following formula:—

$$\text{Diameter of intermediate shaft, in inches} = \sqrt[3]{\frac{SHP}{R}} \times F$$

where SHP is the maximum designed shaft horse power,

R is the number of revolutions per minute at that power.

F = 64 for ocean going and home trade vessels.

F = 58 for vessels trading on estuaries, rivers, lochs and lakes.

12. **Wheel Shafts of Geared Steam Turbine Engines.**—(*a*) Where there are two pinions geared into the wheel, opposite, or nearly opposite, to one another, the diameter of the wheel shaft is not to be less than 1·05 times that required for the intermediate shaft.

(*b*) Where there is only one pinion geared into the wheel, or where there are two pinions which are set to subtend an angle at the centre of the shaft of less than 120°, the diameter of the shaft at the wheel and the adjacent journals is not to be less than 1·1 times that required for the intermediate shaft. Abaft the journals the shaft may be tapered to 1·05 times the diameter required for the intermediate shaft.

13. For dimensions of thrust, tube, and screw shafts, shaft liners, stern bush, shaft couplings and coupling bolts see **clauses 5** to **10.**

STEAM AND OTHER PIPES.

Section 13. 1. Pipes made from the electro deposition of copper on a mandril are not to be used for steam, feed delivery, blow-off or scum.

2. All copper steam, feed, blow-off and scum pipes are to be properly annealed before fixing in place.

3. All copper pipes used for steam, feed, blow off and scum purposes subject to a pressure over 75 lbs. per square inch are to be solid drawn.

4. Steam pipes intended for a working pressure over 180 lbs. per square inch are not to be of copper when the internal diameter exceeds 5 inches. Copper pipes are not to be used for superheated steam.

5. All copper steam pipes on completion and prior to being fitted in place are to be subjected to an hydraulic test of at least twice the working pressure to which they will be subjected.

6. All copper feed delivery pipes are to be hydraulically tested to at least $2\frac{1}{2}$ times the working pressure of the boilers.

7. The working pressure to be allowed on copper pipes is to be determined by the following formula :—

$$WP = \frac{(t - 3) \times F}{D}$$

Where **WP** is the working pressure in lbs. per square inch,

D is the internal diameter in inches,

t is the thickness in 100ths of an inch,

F for solid drawn steam pipes = 60,
for solid drawn feed pipes = 48,
for brazed steam pipes = 45,
for brazed feed pipes = 36.

8. Where copper pipes are bent they are to be made thicker than required by **clause 7** to provide for the thinning at the bend. In no case is the radius of curvature at the centre line of the pipe to be less than twice the external diameter of the pipe.

9. Steam and other pipes may be made of wrought iron or of wrought steel.

10. The process of welding the seams of iron or steel pipes is to be such that it is done by hammering or rolling the joint.

11. On completion of any work on iron or steel steam pipes which involves heating whether for welding the joint, welding on flanges, bending the pipe or for any other purposes the pipes are to be carefully annealed.

12. Mild steel for lap-welded or riveted steam pipes may have a tensile strength not exceeding 28 tons per square inch, with a minimum elongation of 25 per cent on a Standard test piece with a gauge length of 8 inches.

13. Feed pipes if made of steel are to be solid drawn, cold finished.

14. All iron or steel steam pipes prior to being fitted in place are to be subjected to an hydraulic test of at least three times the working pressure to which they will be subjected.

15. All iron or steel feed delivery pipes are to be hydraulically tested to at least four times the working pressure of the boilers.

16. The working pressure to be allowed upon iron or steel steam and feed pipes is to be determined from the following formulæ :—

a. For solid drawn cold finished steel steam pipes,

$$WP = \frac{(t - 10)}{D} \times 120$$

b. For solid drawn hot finished steel steam pipes,

$$WP = \frac{(t - 12)}{D} \times 120$$

c. For lap-welded steam pipes of iron or steel whether with or without covering straps

$$WP = \frac{(t - 12)}{D} \times 90$$

d. For feed delivery pipes,

$$WP = \frac{(t - 8)}{D} \times 100$$

Where **WP** is the working pressure in lbs. per square inch to which the steam pipes will be subjected, and in the case of feed delivery pipes is the boiler pressure,

D is the internal diameter of the pipes in inches ;

t is the thickness in 100ths of an inch.

CYLINDRICAL BOILERS.

Section 14. 1. **General.**—In the design and construction of Marine Boilers the following conditions are to be observed :—

2. Steel plates subject to a direct tensile stress are not to be welded except where the weld is covered by a butt strap or straps. For small steam domes, by special permission, where the welding is done by hammer, and the plates do not exceed $\frac{1}{2}$ inch in thickness, the straps may be omitted. The strength of the weld in such cases is to be assumed as 50 per cent of that of the solid plate.

3. All steel plates which are welded, dished, flanged, or locally heated are to be afterwards efficiently annealed.

4. Butt straps are to be cut from plates and not from rolled strips.

5. All rivet holes are to be drilled, and as far as possible they are to be drilled in place. After drilling the plates the burrs are to be removed and the faying surfaces of the plates cleaned, and the sharp outer edges of holes removed also.

6. Steel stays are not to be welded. If plus threads are desired, the ends of the stay bars may be upset or the bars may be drawn down in the central portions from bars originally of the size of the ends. In either of these two cases the bars are to be subsequently annealed throughout. In double ended boilers the through longitudinal stays are to be supported at or near the middle of their length.

7. Screw stays of combustion chambers where fitted with nuts are to be, as far as possible, normal to the chamber plates. Where this is not possible they are to be fitted with taper washers to provide a fair bed for the nuts.

8. Nuts to screw stays in combustion chambers are to be not less than $\frac{3}{4}$ inch thick for stays up to $1\frac{1}{2}$ inches diameter over threads, $\frac{7}{8}$ inch thick for $1\frac{5}{8}$ and $1\frac{3}{4}$ inch stays, 1 inch thick for $1\frac{7}{8}$ and 2 inch stays, and $1\frac{1}{8}$ inches thick for stays over 2 inches in diameter. The nuts are to be made of solid mild steel or of iron which is to be without weld. The nuts for longitudinal stays are to be to the British standards appropriate to the diameters of the stays, the outside nuts having the thickness therein provided for ordinary nuts, and the inside nuts having the thickness provided for lock nuts.

9. All longitudinal stays and screw stays should have threads in accordance with British standard specification, and true to pitch, viz. :—

Screw stays $1\frac{1}{4}$ inches in diameter and upwards should have 9 threads per inch, and all stays 2 inches in diameter and above passing through plates, and secured by nuts on each side of the plate, should have not more than 6 threads per inch.

It is desirable for the threads of all screw stays to be turned off between the parts fitting into the plates. It is also desirable that the outer ends of screw stays should have a hole $\frac{3}{16}$ inch diameter drilled axially to a distance $\frac{1}{2}$ inch beyond the inner face of shell and end plates.

10. Where jointed longitudinal stays are fitted between the front and back tube plates it is desirable that they should be fitted with pins having an effective sectional area 25 per cent in excess of that of the stay. The pins may be slack in the holes, the total slackness being not more than $\frac{1}{16}$ inch. The pins are to be as close as possible to the shoulder of the eye forging. The shoulder of the forging is to have a diameter not less than 1 inch greater than the diameter of the hole.

Section 15. 1. **Dampers and Baffles.**—Boilers, whether main or auxiliary, in which fuel oil only is used are not to be fitted with a damper, or other possible means of obstruction to draught, in the uptake or funnel.

If the boilers are to use coal and oil fuel alternately, the uptake or funnel dampers, if fitted, must be provided with a suitable device whereby they may be securely locked in the fully open position.

2. The end plates in the steam space in way of uptakes are to be shielded from contact with the heated gases.

Section 16. 1. **Access Arrangements.**—(*a*) Manholes in cylindrical shells are to have their shorter axes arranged longitudinally. Where the cylindrical shell is cut for a manhole, compensation is to be provided and is to be such that the strength in way of the hole is not less than that required for the longitudinal joint.

(*b*) Where a flat plate is flanged to stiffen it at a manhole or sight hole, to permit the same working pressure as would be allowed upon an unpierced plate the depth of the flange measured in inches from the outer surface is to be at least equal to $\sqrt{t \times w}$ where t is the thickness of the plate in inches and w is the minor axis of the hole in inches.

2. The doors to manholes, mudholes, and sight holes are to be built up or pressed to shape and annealed, or made from one thickness of plate with a machined recess for the jointing material. Their spigot part or the recess is not to have a greater clearance than $\frac{1}{16}$ inch all round, *i.e.*, the axes are not to be less than $\frac{1}{8}$ inch smaller than the holes in which they are fitted.

3. The studs for securing all doors are to be screwed through the plate, and they are to be fitted with nuts on the inside or bolts may be used screwed through the plate with the heads inside.

4. All boilers are to be provided, where possible, with means for ingress to permit of examination and cleaning of the inner surfaces of plates and tubes exposed to flame. Where the boilers are too small to permit of this there are to be sight holes and mudholes sufficiently large and numerous to permit of the inside being satisfactorily cleaned.

5. Where the cross tubes of vertical boilers are large there is to be a sight hole in the shell opposite to one end of each tube sufficiently large to permit the tube to be examined and cleaned. These sight holes are to be in positions accessible for that purpose.

Section 17. Hydraulic Tests.—In all new boilers working at pressures up to 100 lbs. per square inch the hydraulic test is to be twice the working pressure. For boilers working at pressures greater than 100 lbs. per square inch the hydraulic test pressure is to be $1\frac{1}{2}$ times the working pressure plus 50 lbs. per square inch.

Section 18. 1. Water Gauges and Test Cocks.—Every boiler is to be fitted with at least two independent means of indicating the water level in it, and have marked on it in a contiguous position, easily seen, the level of the highest part of the combustion chamber. One of these means is to be a glass gauge or an equivalent. The other may be a set of test cocks.

(In the case of boilers of tugs, tenders, coasting and other small vessels engaged on short voyages, and in that of vertical boilers the marking of the level of the highest part of the combustion chamber may be omitted.)

2. Test cocks, where practicable, are to be fitted direct on the boiler shell. A set is to consist of at least three cocks except in boilers 7 feet 6 inches in diameter and under when there may be two. For vertical boilers above 7 feet high the set of test cocks is to consist of at least three.

3. All single-ended boilers, 16 feet mean diameter or over, are to be fitted with a glass water gauge on each side. Single-ended boilers under 16 feet in diameter are to be fitted with one glass water gauge and one set of test cocks, or the equivalent of the latter.

4. All double-ended boilers are to be fitted with a glass water gauge at, or near, each end on opposite sides and a set of test cocks at each end, or the equivalent of the latter.

5. The cocks of all water gauges are to be accessible from positions free from danger in the event of the glass breaking.

6. If the water gauges are not fitted directly to the shell of the boiler but to stand pillars or columns, it is desirable that these pillars or columns should be bolted directly to the shell of the boiler. If they are connected to the boiler by means of pipes the pipes are to be fitted with terminal cocks, not valves, secured direct to the boiler shell. For boilers exceeding 10 feet in diameter the pillars are not to be less than $2\frac{1}{2}$ inches and the connecting pipes not less than $1\frac{1}{2}$ inches internal diameter. For boilers exceeding 7 feet 6 inches but not exceeding 10 feet in diameter the pillars are not to be less than 2 inches and the pipes not less than $1\frac{1}{4}$ inches internal diameter, and for boilers 7 feet 6 inches in diameter and under the pillars are not to be less than $1\frac{3}{4}$ inches and the pipes not less than 1 inch internal diameter. The upper ends of the connecting pipes are to be arranged so that there is no pocket or bend where an accumulation of water from the condensation of the steam can lodge. They should not pass through the uptake if they can be otherwise arranged. If, however, this condition cannot be complied with, they may pass through it by means of a passage at least 2 inches clear of the pipe all round, open for ventilation.

7. A Salinometer cock or valve is to be fitted direct to each boiler in a convenient position. It must not be on the water gauge stand-pipe.

8. Pressure gauges.—Each boiler is to be provided with a separate steam pressure gauge. Double-ended boilers are to be provided with a pressure gauge at each end. The gauges are to be placed where they are easily seen.

9. Feed Checks.—Each boiler is to be fitted with at least two independent means of feed, each with its own check valve. In auxiliary or winch boilers one of the means of feed may be an injector.

Section 19. 1. Blow-off and Scum Valves.—Each boiler is to be fitted with a blow-off valve secured direct to the shell. The valve and its connections to the sea need not be more than $1\frac{1}{2}$ inches in diameter, and may be generally about $\frac{1}{10}$ inch in diameter for each foot in diameter of the boiler. It is, however, to be not less than $\frac{3}{4}$ inch in diameter. Vertical boilers are to be fitted with a blow-off cock or valve.

2. Blow-off valves and scum valves (where these latter are fitted) of two or more boilers may be connected to one

common discharge, but where thus arranged there are to be screw-down non-return valves fitted for each boiler to prevent the possibility of the contents of one boiler passing to another.

3. The blow-off cock or valve on the ship's side is to be fitted above the level of the stokehold plates, in an accessible position, and is to be arranged so that it can be readily seen whether it is open or shut. The cock handle is not to be capable of being removed unless the cock is shut, and if a valve is fitted the wheel is to be fixed to the spindle. The cock or valve is to be fitted with a spigot passing through the plating and a brass or gun-metal ring on the outside.

Section 20. **Stop Valves.**—One main stop valve is to be fitted to each boiler secured direct to the shell. There are to be as few auxiliary stop valves as possible so as to avoid piercing the boiler shell more than is absolutely necessary. The arrangement, however, is to be such that where more than one boiler is fitted it is possible to supply the steam whistle, the steam steering gear, and the electric light machinery from at least two boilers.

Section 21. 1. **Safety Valves.**—At least two safety valves are to be fitted to each boiler. They are to be arranged so that the springs and valves are cased in, that the valves cannot be overloaded when steam is up, that they can be lifted by easing gear, and turned round on their seats by hand, and in case of fracture of springs they cannot lift out of their seats. Easing gear is to be arranged to lift all the safety valves on a boiler together, and is to be workable from some accessible place, free from steam danger.

2. Vertical boilers having 100 square feet, or more, of total heating surface are to be fitted with two safety valves each not less than 1·5 inches diameter; those having less than 100 square feet may have one valve not less than 2 inches diameter.

3. All the safety valves of each boiler may be fitted in one chest, which is to be separate from any other valve chest and is to be connected direct to the boiler by a strong and stiff neck, the passage through which is to be of not less cross-sectional area than one-half the aggregate area of the safety valves in the chest. Each safety valve chest is to be provided with a means by which it can be drained; the drain pipe is to be led to the bilge or to a tank, clear of the boiler.

4. The minimum aggregate area of the safety valves of the ordinary type in each boiler, whether coal fired or oil fired and whether working under natural, forced, or induced draught, is to be found by the following formula:—

Aggregate area of safety valves in square inches

= Total heating surface of the boiler in

$$\text{square feet} \times \left(\frac{C}{p + 15}\right)$$

where p is the working pressure in lbs. per square inch. C being 1·25 for boilers using coal, and 1·5 for those using oil fuel, and for all boilers with closed stokehold forced draught.

5. The waste-steam pipe and the passages leading to it are to have a cross-sectional area not less than 1·1 times the combined areas of the safety valves as given by the above formula.

6. All safety valves are to be set to the required pressure under steam. During a test of 15 minutes with the stop valves closed and under full firing conditions the accumulation of pressure is not to exceed 10 per cent of the loaded pressure. During this test no more feed-water should be supplied than is necessary to maintain a safe-working water level.

Section 22. 1. **Boiler Mountings.**—All boiler mounting valves over $1\frac{1}{2}$ inches diameter, are to be fitted with outside screws, and the covers are to be secured by bolts or studs. All valves are to be arranged to be shut with a right-hand motion of the wheels, and are to be provided with means for clearly indicating whether they are open or shut.

2. All cocks and valves connected to the boiler are to be such that it is seen without difficulty whether they are open or shut. Where boiler mountings are secured by studs, the studs are to have a full thread holding in the plate for a length of at least one diameter. If the stud hole penetrates the whole thickness of the plate the stud is to be screwed right through the plate and is to be fitted with a nut inside the boiler. Where bolts are used for securing mountings they are to be screwed right through the plate with their heads inside the boiler.

3. Where a superheater is fitted which can be shut off from the boiler it is to be provided with a separate safety valve fitted with easing gear. The valve as regards construction is to comply with the regulations for ordinary safety valves but the easing gear may be fitted to be workable from the stokehold only. The superheater is also to be fitted with a drain cock or valve to free it from water when necessary.

4. All stop and safety valve chests and steam-pipe fittings where subjected to saturated steam only may be made of cast iron, but such valve chests and steam-pipe fittings where subjected to steam of a temperature above 425° F. are to be of cast steel or other approved material.

RULES FOR DETERMINING THE WORKING PRESSURE TO BE ALLOWED IN NEW BOILERS.

Cylindrical Shells.

Section 23. 1. For the cylindrical shells of steel marine boilers the maximum working pressure (which is designated by W P and is in lbs. per square inch) to be allowed is to be calculated from the following formulæ :—

Where the thickness of the shell plates does not exceed $1\frac{3}{4}$ inches.

$$WP = \frac{(t - 2) \times S \times J}{C \times D}$$

Where the thickness of the shell plates exceeds $1\frac{3}{4}$ inches, and the longitudinal seams are made with double butt straps.

$$WP = \frac{t \times S \times J}{2{\cdot}85 \times D}$$

In the above formulæ

t is the thickness of the shell plates in 32nds of an inch,

S is the minimum tensile strength of the steel shell plates in tons per square inch,

J is the percentage of strength of the longitudinal seams calculated by the methods described hereafter,

C is a coefficient, which is 2·75 where the longitudinal seams are made with double butt straps, 2·83 where the longitudinal seams are made with lap joints and are treble riveted, 2·9 where they are made with lap joints and are double riveted and 3·3 where they are made with lap joints and are single riveted.

D is the inside diameter of the outer strake of plating of the cylindrical shell measured in inches.

2. The percentage of strength of a riveted joint (J) is found from the following formulæ (i), (ii), (iii): (i) and (ii) are applicable to any type of joint, (iii) is applicable only to that type of joint in which the number of rivets in the inner rows is double that in the outer row. The lowest value given by the application of these formulæ is to be taken as the percentage of strength of the joint.

(i) Percentage of strength of plate at joint as compared with solid plate $= \frac{100\ (p - d)}{p}$

(ii) Percentage of strength of rivets as compared with solid plate

$$= \frac{100\ (S_2 \times a \times n \times C)}{S_1 \times p \times T}$$

(iii) Percentage of combined strength of the plate at the inner row of rivet holes and of the rivets in the outer row

$$= \frac{100\ (p - 2\ d)}{p} + \frac{100\ (S_2 \times a \times C)}{S_1 \times p \times T}$$

where p = pitch of rivets at outer rows in inches,

d = diameter of rivet holes in inches,

a = sectional area of one rivet in square inches,

n = number of rivets which are fitted in the pitch p,

T = thickness of plate in inches,

C = 1·0 for rivets in single shear as in lap joints,

C = 1·875 for rivets in double shear as in double butt-strapped joints,

S_1 = minimum tensile strength of plates in tons per square inch,

S_2 = shearing strength of rivets, which is taken generally to be 23 tons per square inch, and may be 85 per cent of the minimum tensile strength of the rivet bars.

3. Where the longitudinal seams are fitted with double butt-strapped joints, the outer butt strap is to be at least 0·625 of the strength of the plate, and is to be of sufficient thickness to permit of efficient caulking of its outer edges. The inner butt strap is to be $\frac{4}{32}$ inch thicker than this.

In cases where the number of rivets in the inner rows is double the number in the outer row, this will require the thickness of the outer strap to be

$$t_o = \frac{5 \times (p - d)}{8 \times (p - 2\ d)} \times T,$$

and that of the inner strap to be at least

$$t_n = \frac{5 \times (p - d)}{8 \times (p - 2\ d)} \times T + \frac{4}{32} \text{ inch.}$$

4. In all cases the clear space between a rivet hole and the edge of a plate is not to be less than the diameter of the rivet hole, *i.e.*, the centre of the rivet hole is to be at least $1\frac{1}{2}$ diameters distant from the edge of the plate.

In joints whether lapped or fitted with butt straps, in which there are more than one row of rivets and in which there is an equal number of rivets in each row, the distance between the rows of rivets is not to be less than 0·33 p + 0·67 d with zigzag riveting, or 2 d with chain riveting.

In joints in which the number of rivets in the outer rows is one-half of the number in each of the inner rows, and in which the inner rows are chain riveted, the distance between outer rows and the next rows is not to be less than 0·33 p + 0·67 d or 2 d, whichever is the greater, and the distance between the rows in which there are the full number of rivets is not to be less than 2 d.

In joints in which the number of rivets in the outer rows is one-half of the number in each of the inner rows, and in which the inner rows are zigzag, the distance between the outer rows and the next rows is not to be less than 0·2 p + 1·15 d, and the distance between the rows in which there are the full number of rivets is not to be less than 0·165 p + 0·67 d.

In the above p is the pitch of the rivets in the outer rows.

5. The maximum pitch of the rivets in the longitudinal joints of boiler shells is to be—

Maximum pitch in inches = $C \times T + 1\frac{5}{8}$ inches

where T is the thickness of the plate in inches and C is a coefficient as given in the following Table :—

Number of Rivets per pitch.	Coefficients for Lap Joints.	Coefficients for Double Butt-strapped Joint.
1	1·31	1·75
2	2·62	3·50
3	3·47	4·63
4	4·14	5·52
5	—	6·00

6. If holes are cut in the cylindrical shells of boilers for fixing of mountings, the diameters of the holes being greater than $2\frac{1}{2}$ times the thickness of the shell plating plus $2\frac{3}{4}$ inches, compensation is to be fitted as in the case of manholes. (See Section 16, clause 1, paragraph (*a*).)

7. Where more than three screw stays pierce the cylindrical shell in a horizontal line, if d is their diameter and p the pitch, $\frac{100\ (p - d)}{p}$ should not be less than the percentage of strength required for the shell longitudinal joints. If this is not possible, the stays are to be arranged out of line with one another longitudinally.

8. The riveting of the seams joining the end plates to the cylindrical shell is not to be less than 42 per cent of that of the solid shell plate. Where the shell plates exceed $\frac{5}{8}$ inch in thickness the seams connecting the shell plates to the end plates are to be at least double riveted. Where the shell plates exceed $\frac{1}{2}$ inch in thickness the intermediate circumferential seams of double-ended boilers are to be at least double riveted.

9. The circumferential seam at or near the middle of the length of single-ended boilers is to have a strength of joint not less than 60 per cent of the solid plate. The inner circumferential seams of double-ended boilers are to have a strength of joint not less than 62 per cent of the solid plate. In any case there are to be at least three rows of rivets where single-ended boilers have shell plates over $1\frac{3}{8}$ inch in thickness and where double-ended boilers have shell plates over $1\frac{3}{16}$ inch in thickness.

10. The circumferential seams of the shells of vertical boilers are to have a strength of not less than 42 per cent of the solid plate. Where these seams are not complete circles, and where the shell plates exceed $\frac{5}{8}$ inch in thickness, the riveting is to be at least double.

Furnaces.

Section 24. 1. The working pressure to be allowed on corrugated furnaces is to be determined by the following formula :—

$$WP = \frac{C\ (t - 1)}{D}$$

where D is the external diameter measured at the bottom of the corrugations in inches,

t is the thickness of the furnace plate in 32nds of an inch, measured at the bottom of the corrugation or camber,

C is a coefficient which is 480 for the Fox, Morison, Deighton, Purves, and other similar furnaces, and is 510 for the Leeds Forge Bulb Suspension furnace.

2. The working pressure to be allowed on plain furnaces or furnaces strengthened by the Adamson or other joints, and on the cylindrical bottoms of combustion chambers, is to be determined by the following formulæ, the least pressure obtained by either formula being taken :—

$$WP = \frac{C\ (t - 1)^2}{(L + 24) \times D}$$

$$\text{or } WP = \frac{C_1}{D} \times [10\ (t - 1) - L]$$

where D is the external diameter of the furnace or combustion chamber in inches,

t is the thickness of the furnace plate in 32nds of an inch,

L is the length of the furnace or of combustion chamber bottom or the length between points of substantial support, in inches, measured from the centres of rivet rows or from the commencement of flange curvature, whichever is applicable,

C is 1450 where the longitudinal seams are welded and 1300 where they are riveted,

C_1 is 50 where the longitudinal seams are welded and 45 where they are riveted,

WP is the working pressure in lbs. per square inch.

3. Where the furnaces are tapered the diameter to be taken for calculation purposes is to be the mean of that at the top, and of that at the bottom where it meets the substantial support from flange or ring. The length for the same purpose is to be the distance from the centre of the row of rivets connecting the crown to the body of the furnace to the substantial support at the bottom of the furnace, or to a row of screwed stays connecting the furnace to the shell, provided the pitch of stays at the furnace does not exceed 14 times the thickness of the furnace plate where the stays are riveted at their ends, and 16 times where they are fitted with nuts. Such screwed stays are to be in diameter over the threads not less than 2·25 times the thickness of the furnace plate.

4. Where the furnaces are spherical in form and convex upwards at their tops, and are without support from stays of any kind :—

$$WP = \frac{275\ (t - 1)}{R}$$

where t is the thickness of the top plate in 32nds of an inch,

R is the outer radius of curvature of the furnace in inches.

5. For the ogee ring which connects the bottom of the furnace to the shell, and sustains the whole load on the furnace vertically :—

$$WP = \frac{140\ (t - 1)^2}{D \times (D - d)}$$

where t is the thickness of the ogee ring in 32nds of an inch,

D is the inside diameter of the boiler shell in inches,

d is the outside diameter of the lower part of the furnace where it joins the ogee ring in inches.

6. Furnaces, plain or corrugated, are not to exceed $\frac{13}{16}$ inch in thickness.

Flat Plates supported by Stays secured in various ways.

Section 25. 1. The working pressure to be allowed on flat plates supported by stays is to be calculated by the following formula :—

$$WP = \frac{(t - 1)^2 \times C}{a^2 + b^2}$$

In this formula and in that in clauses 8 to 11

WP is the working pressure in lbs. per square inch,

t is the thickness of the flat plate in 32nds of an inch,

t_w is the thickness of the washers, strips, or doublings employed also in 32nds of an inch,

a is the distance apart of the rows of stays in inches,

b is the pitch of the stays in the rows in inches,

C is a coefficient which varies with the method of fixing the stays as follows :—

Where the plates are exposed to flame and the stays are screwed into the plate and their ends are riveted over C = 50. Where the plates are not exposed to flame and the stays are screwed into the plate and their ends are riveted over C = 57. In these cases the thickness of the plate is to be at least half the diameter of the stay required by the Rules.

Where stay tubes are screwed into tube plates and expanded C = 52. If they are fitted with nuts C = 72.

Where the plates are exposed to flame and the stays are screwed into the plate and fitted with nuts on the outside C = 75. Where the plates are not exposed to flame C = 86.

Where the stays pass through the plates not exposed to flame and are fitted with nuts inside and outside C = 96, and where the plates are exposed to flame C = 84.

2. Where plates are stiffened by flanging, the inner radius of which is not greater than $2\frac{1}{2}$ times the thickness of the plate, for the support thus given C = 110 where the plates are not exposed to flame and C = 96 where they are exposed to flame. The pitch is to be reckoned from the commencement of the curvature.

3. For portions of plate where the stays are irregularly pitched d^2 is to be used instead of $a^2 + b^2$, d being the diameter of the largest circle which can be drawn passing through not less than three points of support, viz., the

centres of stays or the commencement of the curvature of flanging whichever is applicable. In this case C is to be taken as the mean of the values appropriate for the points of support.

4. For the tops and sides of combustion chambers the distance between the rows of stays nearest to the back tube plate or the back plate respectively and the commencement of curvature of these plates at their flanges is not to be greater than a.

5. It is desirable that the stays of the combustion chambers should be so placed that the seams of the plates can be caulked without removing the stay nuts.

6. For the tops of combustion chambers where they are joined to the sides by curved portions, if the outer radius of the curved portion is less than half the allowable distance between the girders, the distance between the first girder and the inner surface of the side plate is not to exceed the allowable distance between the girders. If the radius of the curved portion is greater than half the allowable distance between the girders, the width of the flat portion measured from the centre of the girder is not to be more than half the allowable distance between the girders.

7. Where portions of plate are supported by stays secured in different ways the value of C to be taken is the mean of the values appropriate to the method of securing the supporting stays.

8. Where the plates are supported by stays passing through them and are fitted with nuts inside and washers and nuts outside, the diameter of the washers being at least 3·5 times that of the stay, and their thickness at least two-thirds of that of the plate but not greater than that of the plate :—

$$WP = \frac{100}{a^2 + b^2}[(t - 1)^2 + 0{\cdot}15\ t_w^2]$$

9. Where the washers have a diameter of at least two-thirds of the pitch of the stays and a thickness of at least two-thirds of the thickness of the plate but not greater than that of the plate and are riveted to the plate in an efficient manner :—

$$WP = \frac{100}{a^2 + b^2}[(t - 1)^2 + 0{\cdot}35\ t_w^2]$$

10. Where the plate is stiffened by strips at least two-thirds of the pitch of the stays in breadth and having a thickness at least two-thirds of that of the plate but not greater than that of the plate and are riveted to the plate in an efficient manner :—

$$WP = \frac{100}{a^2 + b^2}[(t - 1)^2 + 0{\cdot}55\ t_w^2]$$

11. Where the plates are fitted with doubling plates having a thickness of at least two-thirds of that of the plate but not greater than that of the plate and are riveted to them :—

$$WP = \frac{100}{a^2 + b^2}[(t - 1)^2 + 0{\cdot}85\ t_w^2]$$

12. For the portions of tube plates in the nests of tubes :—

$$WP = \frac{C\ (t - 1)^2}{p^2}$$

where t is the thickness of the tube plate in 32nds of an inch,

p is the mean pitch in inches of the stay tubes supporting any portions of the plate (being the sum of the four sides of the quadrilateral divided by 4),

C = 38 where the stay tubes are screwed and expanded into the plate and nuts are not fitted,

C = 49 where the stay tubes are screwed and expanded into the plates and fitted with nuts.

13. For the wide water spaces of front tube plates between the nests of tubes and between the wing rows of tubes and the shell :—

$$WP = \frac{C[(t-1)^2 + 0{\cdot}55t_w^2]}{a^2 + b^2}$$

where t is the thickness of the front tube plate in 32nds of an inch,

t_w is the thickness of the doubling plate, where so fitted in 32nds of an inch,

a is the horizontal pitch of stay tubes in inches measured across the wide water space,

b is the vertical pitch of stay tubes in the bounding rows, in inches, measured from centre to centre,

C = 52 where the stay tubes are screwed and expanded into the tube plate and nuts are not fitted,

C = 72 where the stay tubes are screwed and expanded into the tube plates, and nuts are fitted to each stay tube,

C = 63 where the stay tubes are screwed and expanded into the tube plates, and nuts are fitted only to alternate stay tubes.

14. If steel of less strength than 26 tons per square inch is used for flat plates, the working pressure allowed is to be correspondingly reduced.

Tube Plates under Compression.

Section 26. The pressure to be allowed on tube plates is to be calculated by the following formula, in which the compressive stress is taken at 14,000 lbs. per square inch :—

$$WP = 875 \times \frac{(D - d) \times t}{W \times D}$$

where t is the thickness of the tube plate in 32nds of an inch.

D is the horizontal distance apart of the tubes centre to centre in inches,

d is the internal diameter of the plain tubes in inches,

W is the width of combustion chamber in inches measured inside from tube plate to back chamber plate, or between tube plates in double-ended boilers with combustion chambers common to two opposite furnaces.

Tube Plates of Vertical Boilers.

Section 27. Where vertical boilers have a nest or nests of horizontal tubes so that there is direct tension on the tube plates due to the vertical load on the boiler ends or to their acting as horizontal ties across the shell, the thickness of the tube plates and the spacing of the tubes are to be such that the section of metal taking the load is sufficient to keep the stress within that allowed on the shell plates.

Further, each alternate tube in the outer vertical rows of tubes is to be a stay tube. The tube plates between the stay tubes are to be in accordance with the rules for tube plates as in Section 25, clause 12, and in addition

$$WP = \frac{(t - 2) \times S \times (p - d) \times 100}{2{\cdot}9 \times D \times p}$$

where S is the minimum tensile strength of the steel plate in tons per square inch,

t is the thickness of the tube plate in 32nds of an inch,

D is twice the radial distance of the centre of the outer row of tube holes from the axis of the shell in inches,

p is the vertical pitch of tubes in inches,

d is the diameter of the tube holes in inches.

Girders.

Section 28. For girders supporting the tops of combustion chambers the following formula is to be used :—

$$WP = \frac{C \times d^2 \times t}{(L - P) \times D \times L} \times \frac{S}{28}$$

where d is the depth of the girder at centres in inches ;

t is the thickness of the girder at centre, where this is a forging, or the sum of the thicknesses of the plates where the girder is made of two plates, measured in 32nds of an inch ;

L is the length of the girder in inches, measured between the tube plate and back chamber plate inside, or between tube plates in chambers common to two opposite furnaces ;

P is the pitch of stays supported by the girder, in inches ;

D is the distance apart of the girders, centre to centre, in inches ;

S is the minimum tensile strength of the steel plates forming the girder, in tons per square inch. In the case of forged girders S is to be taken as 24 for iron and 28 for steel ;

C is a coefficient as follows :—

$$C = \frac{n}{n + 1} \times 495,$$

where the number of stays in each girder is odd,

$$= \frac{n + 1}{n + 2} \times 495,$$

where the number of stays in each girder is even, n being the number of stays to each girder.

Stays.

Section 29. 1. For screw stays with threads not coarser than 9 threads per inch, made of steel or of special wrought iron tested to the requirements of the Rules (*See* Section 8 of the **Rules for the Quality and Testing of Materials**), the following formula is to be used, but in no case is the stress to exceed 9,000 lbs. per square inch :—

$$WP = \frac{(d - 0{\cdot}267)^2 \times 8250}{a}$$

where d is the diameter of the stay over the thread in inches,

a is the area in square inches supported by one stay.

2. For steel longitudinal stays with threads not coarser than 6 threads per inch the working pressure is to be calculated from the following formula, but in no case is the stress to exceed 11,000 lbs. per square inch where steel of a minimum tensile strength of 28 tons per square inch is used :—

$$WP = \frac{(d - 0{\cdot}340)^2 \times 9500}{a} \times \frac{S}{28}$$

where d is the diameter of the stay over the thread in inches,

a is the area in square inches supported by one stay,

S is the minimum tensile strength of the steel in tons per square inch.

3. In cases where longitudinal stays are made with enlarged ends and the body of the stay is smaller in diameter than at the bottom of the thread, and in cases where coarser threads than 6 per inch are used the working pressure is to be calculated from the following formula :—

$$WP = \frac{(d^1 - 0{\cdot}125)^2 \times 9500}{a} \times \frac{S}{28}$$

where d^1 is the diameter of the stay at the bottom of the thread or at the smallest part of the body.

Boiler Tubes, Plain and Stay.

Section 30. 1. The following table gives the working pressures permissible with plain boiler tubes of standard thicknesses, whether of lapwelded wrought iron or of lapwelded or seamless mild steel :—

Outside Diameter of tube in inches.	Standard thicknesses in L. S. G.				Working pressures in lbs. per sq. inch.			
	A	B	C	D	A	B	C	D
2		11	10	9		155	215	300
2¼	11	10	9	8	140	190	260	315
2½	11	10	9	8	125	175	230	300
2¾	11	10	9	8	110	160	215	275
3	10	9	8	7	140	190	250	300
3¼	10	9	8	7	130	180	230	280
3½	10	9	8	7	120	165	215	260

2. On stay tubes, whether of wrought iron or of lapwelded steel, a working stress of 7,500 lbs. per square inch of the net sectional area at the bottom of the thread is allowed.

3. The minimum thickness of stay tubes measured under the threads is to be $\frac{1}{4}$ inch for marginal stay tubes and $\frac{3}{16}$ inch for other stay tubes.

4. Stay tubes are to be screwed at both ends with continuous threads, and the holes in the tube plates are to be tapped with continuous threads. The pitch of the thread is not to be finer than 10 threads per inch. It is desirable however that they should be screwed to the standard 9 threads per inch. The stay tubes are to be expanded by roller expanders and not made tight by caulking only.

5. Nuts are not to be fitted to stay tubes at the combustion chamber end.

6. If stay tubes are increased in thickness at the screwed ends so that the thickness at the bottom of thread is practically the same as in the body of the tube, the thickening is to be attained by upsetting and not by any welding process, and the tubes are to be annealed after the upsetting.

Dished Plates without Stays.

Section 31. 1. For ends of steam chests, crowns of vertical boilers or other plates which are dished outwards to partial spherical form and not fitted with stays the following formula is to be used :—

$$WP = \frac{15 \times S\,(t - 1)}{R}$$

WP is the working pressure in lbs. per square inch,

t is the thickness in 32nds of an inch,

R is the inner radius of curvature of the end in inches which is not to exceed the diameter of shell,

S the minimum tensile strength of plates in tons per square inch.

The inside radius of curvature at the flange connecting the end to the cylindrical shell is not to be less than 4 times the thickness of the end plate and in no case less than 2·5 inches.

2. Where the end has a manhole in it $\frac{4}{32}$ inch is to be added to the thickness of plate.

If the plate at the manhole is stiffened by flanging, the total depth of the flange from the outer surface, in inches, is to be at least

$$= \sqrt{t \times w}$$

t is the thickness of plate in inches,

w is the minor axis of the hole in inches.

3. Where the end or crown is a complete hemisphere without stays or other supports, and is made in more than one plate, the working pressure to be allowed is given by the following formula :—

$$WP = \frac{(t - 2)\,S \times J}{C \times R}$$

where t is the thickness of the plates in 32nds of an inch,

S is the minimum tensile strength of the steel plates in tons per square inch,

J is the strength of riveted joint per cent of the solid plate,

R is the inner radius of curvature, in inches,

C is a coefficient which for treble riveting is 2·83, for double riveting is 2·9, and for single riveting is 3·3.

WATER TUBE BOILERS.

Section 32. 1. **General.**—Water tube boilers are, as regards construction, and the quality and tests of the material used in their construction, to comply with the general **Rules for Cylindrical Boilers,** except as hereinafter specified ; and they are to be so designed as to ensure water circulation over every part of surfaces exposed to flame when working under service conditions.

2. **Water Gauges.**—The position of the glass water gauges of boilers in which the tubes are entirely drowned when cold is to be such that water is just showing in the glass when the water level in the steam drum is just above the top of the uppermost tubes when the boiler is cold. In boilers, the tubes of which are not entirely drowned when cold, the glass water gauges are to be placed, to the Surveyor's satisfaction, in the positions which have been found by experience to indicate satisfactorily that the water content is sufficient for safety when the boiler is worked under all service conditions.

3. **Longitudinal Joints.**—The longitudinal joints of the cylindrical drums of water tube boilers, the internal diameters of which are less than 100 times the thickness of the plating at the joints, are not to be of ordinary riveted lapped type, but are to be such as to maintain internal circularity of section.

4. **Inclination of Water Tubes.**—The tubes which connect the drums or headers, and are the means for circulating the water when generating steam, are to be set at an inclination of not less than 15 degrees from the horizontal, but in the case of boilers where each tube is in series with one or more tubes so as to form a continuous run, the inclination need not exceed 5 degrees.

5. **Deposit Receptacles.**—It is desirable that provision should be made in the design so that solid matter in the water can be deposited automatically without danger arising from such matter collecting on parts exposed to heat.

6. **Protection of Steam Drum.**—Where the bottom of the steam drum is exposed to radiation from the fire, or to the impact of hot gases, and it is not protected by the tubes, a shield of good refractory material whose conductivity is low is to be fitted, or the tube plate is to be suitably thinned at this part.

Construction of Water Tube Boilers.

Section 33. 1. **Tube Ends.**—All tubes are to be carefully drifted or roller expanded in the holes in the tube plates. They are to project through the neck or bearing part in the holes by at least a $\frac{1}{4}$ inch. They are to be secured from drawing out at each end, and if this is done by bellmouthing only, the bellmouthing is to be $\frac{1}{32}$ inch for each inch in external diameter plus $\frac{2}{32}$ inch. That is, the increase of diameter at the outer end of the bellmouth for a tube of 1 inch in diameter is to be $\frac{3}{32}$ inch, for a 2 inch tube $\frac{4}{32}$ inch, and for a 3 inch tube $\frac{5}{32}$ inch.

2. **Tube Holes.**—(*a*) The tube holes in the tube plates of drums, pockets or headers are to be formed in such a way that the tubes can be effectively tightened in them. Where the tube ends are not normal to the tube plates, there is to be a neck or belt of parallel seating of at least $\frac{1}{2}$ inch in depth measured in a plane through the axis of the tube at the holes.

(*b*) Where the tubes are practically normal to their plates, this parallel seating is not to be less than $\frac{3}{8}$ inch in depth.

3. **Thinning of Tube Plates.**—Where the tube plates are reduced in thickness for the purpose of jointing either by lapping or by the fitting of butt straps, or in order to receive the drum end flanges, such reductions are to be gradual and carefully machined to size.

4. **Thickness of Tubes.**—The minimum thickness of tubes is to be calculated by the following formula :—

$$\text{Thickness of tube} = \frac{WP \times d}{F} + 7$$

$$\text{or } WP = \frac{(t - 7)}{d} \times F$$

where WP is the working pressure in lbs. per square inch,

d is the external diameter, in inches,

t is the thickness in 100ths of an inch.

For the two rows of tubes next the fire and round the gaps formed in the nests of tubes for the outflow of the hot gases from the fire, $F = 55$. For all the other tubes F is not to exceed 75.

5. **Tube Plates.**—Where tube plates form portions of cylindrical drums, their thickness in way of the tube holes is to be calculated by the following formula :—

$$t = \frac{WP \times C \times D}{S \times J} + 4$$

$$\text{or } WP = \frac{(t - 4)\ S \times J}{C \times D}$$

where **D** is the internal diameter of the drum in inches

t is the thickness of tube plates in 32nds of an inch,

S is the minimum tensile strength of the plate forming the drum in tons per square inch,

J is the percentage strength of the plate through the tube holes, viz. :— $\frac{p - d}{p} \times 100$,

p is the pitch of the tubes in inches on lines parallel with the axis of the drum,

d is the diameter of the tube holes in inches,

C = 3.

6. **Headers and Analogous Fittings.**—These may be of wrought or cast steel, or of such other material as may be approved. If wrought steel is used, the material is to comply with the **Rules for the Quality and Testing of Materials.** If cast steel is used, the material is to comply with the aforementioned rules, or, alternatively, with the British Engineering Standards Specification for Grade C Cast Steel, which prescribes an elongation of not less than 15 per cent, measured on the Standard test piece, and a bend test through 90 degrees, without fracture of the test piece, the internal radius of the bend being not greater than 1 inch.

7. **Flat Surfaces of Headers and Similar Parts.**—(*a*) Where flat surfaces of headers or similar parts are not pierced for tubes, the thickness of such parts is not to be less than that given by the following formula :—

$$t = b \times \sqrt{\frac{WP}{C}} + 3$$

$$\text{or } WP = \left(\frac{t - 3}{b}\right)^2 \times C$$

where t is the thickness in 32nds of an inch,

b is the breadth (in inches) of the flat surface measured from support to support inside,

C = 81 for wrought steel,

C = 64 for steel castings.

(*b*) The thickness of the headers at the tube holes in 32nds of an inch is not to be less than

$$t = 3 \times \sqrt{d} + 8$$

where d is the diameter of the hole in inches.

(*c*) The headers in way of the sighting doors are to be machined to give true and fair faces for the doors to joint upon. The thickness where machined may be as much as $\frac{3}{32}$ inch less than given by the above rule, but generally it is not to be less than $\frac{10}{32}$ inch.

(*d*) The thickness of all headers which are exposed to radiation from the fire, or to the impact of hot gases, and which have only steam within them under service conditions, as is the case with superheaters, is to be 12·5 per cent greater than that given by the above formula.

(*e*) The sighting hole doors are to be substantial, and capable of being removed and replaced from time to time without loss of efficiency or safety. Where they are held in place by bolts, the doors are to be so designed that they will not blow out in the case of the breakage of the bolt or otherwise.

(*f*) Every flange is to have a fillet with a radius not less than the thickness of the neck to which it is attached.

Boiler Mountings and Fittings for Water Tube Boilers.

Section 34. 1. **Safety Valves.**—(*a*) The safety valves are to be in number, design and ordinary construction, in agreement with **Section 21** of the **Rules for Cylindrical Boilers,** except that the total valve area required is to be as follows :—

$$\left.\begin{array}{l}\text{Aggregate area of safety}\\ \text{valves in square inches}\end{array}\right\} = \text{T.H.S.} \times \left(\frac{C}{p + 15}\right)$$

where T.H.S. is the total external surface in square feet of the tubes and other parts of the boiler exposed to heat so as to cause evaporation,

p is the working pressure in lbs. per square inch,

C for coal fired boilers is, with natural draught 1·1, and with forced draught 1·25. For oil fired boilers **C** is 1·25.

(*b*) An approved type of safety valve of equally good and reliable design may be fitted in lieu of those described in the Rules.

2. **Waste Steam Pipe.**—The waste steam pipe and passages leading to it from the safety valves are to be in area of cross section not less than 1·1 times the combined area of the valves as given by the above formula.

3. **Accumulation Tests.**—Tests for accumulation of pressure are to be carried out with the stop valve closed and under full firing conditions for as long a time as the water supply in the boiler permits, but in no case need they exceed 7 minutes in duration. The accumulation is not to exceed 10 per cent of the working pressure.

4. **Stop Valves.**—Where there are more boilers than one connected together, stop valves of self-closing or non-return types are recommended.

5. **Water Gauges.**—There are to be at least two water gauges to each boiler, fitted in such a way as to be quite independent of each other. One of them is to be a glass water gauge, while the other may be an equivalent; but where water and steam drums exceeding 13 feet in length are fitted athwartship a glass water gauge is to be fitted at or near each end of the drum.

6. **Feed Water Fittings.**—(*a*) Each boiler is to be fitted with at least two distinct and independent feed systems, each with its own check valve attached direct to the boiler. At least one of these systems is to be fitted with an approved apparatus whereby the supply is controlled automatically.

(*b*) The feed check valves are to be fitted with efficient gearing, whereby they can be satisfactorily worked from the stokehold floor, or other convenient position.

7. **Manholes.**—In all the drums, manholes are to be provided of such size as to permit of access for internal examination, and for the satisfactory fitting of all the tubes in place.

8. **Mountings and Fittings.**—Those not referred to in this Section are to be in accordance with **Sections 18, 19, 20** and **22**, of the **Rules for Cylindrical Boilers.**

Tubes for Water Tube Boilers.

Section 35. 1.—All tubes subject to internal pressure are to be solid drawn and made of steel produced by an open-hearth process, acid or basic, the ultimate tensile strength of which does not exceed 28 tons per square inch, and the elongation of which is not to be less than 30 per cent on a Standard Test Piece C (British Engineering Standards Association Test Piece F), when in the billet or bar form, and is to be certified as such by the makers of the steel and of the tubes.

2. All tubes under $1\frac{1}{2}$ inches external diameter are to be cold finished; these, and all other cold-drawn tubes, are to be satisfactorily annealed before examination.

3. All tubes are to be free from defects, both within and without.

Tests of Tubes for Water Tube Boilers.

Section 36. 1.—All tubes up to 10 L.S.G. in thickness are to be capable of being flattened by hammering when cold until the inner surfaces are not further apart than $\frac{2}{32}$ inch. For those over 10 L.S.G., and not exceeding 6 L.S.G., the maximum distance apart is to be $\frac{7}{32}$ inch; for those over 6 L.S.G., and not exceeding 3 L.S.G., the maximum distance apart is to be $\frac{12}{32}$ inch; and for those whose thickness exceeds 3 L.S.G., the maximum is to be $\frac{18}{32}$ inch. In all cases after undergoing such tests there are not to be any signs of cracking or other fracture.

2. All tubes when cold are to be able to withstand, without cracking, an enlargement of diameter at both ends by means of roller expanders, or by drifts to the extent of:—

Thickness of Tubes.	Enlargement of Diameters at Ends by means of	
	Roller Expanders.	Drifts.
Up to 10 L.S.G.	12·5 per cent	9·5 per cent
Above 10 L.S.G. & up to 6 L.S.G.	9·5 per cent	7·0 per cent
Above 6 L.S.G.	6·5 per cent	5·5 per cent

3. (*a*) Tubes should be presented for test in batches of 100 each. Two tubes are to be selected indiscriminately from each of at least two batches, and one from each of any remaining batches. Each tube so selected is to be subjected to the above expanding tests, and one tube from each batch, which may be a tube that has sustained the expansion test, is also to be flattened cold to the extent specified in **clause 1** at three different parts of its length, of which one position is to be at or near the middle of the tube, and the flattened portions are to be in three different planes. The tubes are to pass these tests without signs of cracking.

(*b*) Should one of the selected tubes fail to withstand either of these tests, two further tubes are to be selected from the batch and be subjected to both the prescribed tests. If further failure occurs the particular batch of tubes is to be rejected as unsatisfactory.

4. (*a*) Every tube is to be tested at the Tube Maker's Works by hydraulic pressure to not less than 1,000 lbs. per square inch.

(*b*) Downcomer tubes are to be tested as required for steam pipes.

5. The manufacturer's certificate of the results of the foregoing tests may, at the discretion of the Surveyor, be accepted provided each tube is delivered with 1 inch in excess of the finished length, which excess is to be partly severed for flattening to the extent prescribed in **clause 1.**

6. Every tube delivered is to be straight (unless otherwise specified), and is to be practically concentric throughout its length. The tolerance or deviation from the specified thickness is not to exceed 5 per cent deficiency at the thinnest part, nor 10 per cent excess at the thickest part. These limits apply also to the deviations from concentricity.

The tolerances in external diameter from those specified are to be as follows, viz:—

(*a*) For all tubes up to $1\frac{3}{8}$ inches in external diameter the tolerance is not to exceed $\frac{7}{1000}$ inch plus, or $\frac{3}{1000}$ inch minus.

(*b*) For all tubes over $1\frac{3}{8}$ inches and up to $1\frac{1}{2}$ inches diameter, $\frac{1}{64}$ inch plus or minus.

(*c*) For all tubes over $1\frac{1}{2}$ inches diameter $\frac{2}{64}$ inch plus or $\frac{1}{64}$ inch minus.

Spare Gear.

Section 37. The articles of spare gear mentioned in the following list will be required to be carried in all vessels fitted with steam Reciprocating Engines classed in the Society's Register Book, viz.:—

2 connecting rod or piston rod top-end bolts and nuts.
2 connecting rod bottom-end bolts and nuts.
2 main bearing bolts.
1 set of coupling bolts.
1 set of feed and bilge pump valves.
1 set of piston springs (where common springs are used).
A quantity of assorted bolts and nuts.
Iron of various sizes.

In addition to the foregoing the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz.:—

Crank shaft.
Propeller shaft.
Propeller, or a full set of blades.
Stern bush, or lignum vitæ lining for bush.
1 pair of connecting rod brasses.
1 pair of cross head brasses.
1 set of link brasses.
1 eccentric strap complete.
Air pump rod.
Water circulating pump rod.
H. P. valve spindle.
L.P. valve spindle.
1 set of check valves.
6 cylinder cover bolts.
6 junk ring bolts.
4 valve chest cover bolts.
2 dozen boiler tubes.
3 dozen condenser tubes.
1 cylinder escape valve and spring.
1 set of safety valve springs.

Spare Gear for Steam Turbine Engines.

In vessels classed in the Society's Register Book fitted with Steam Turbine Engines the articles of spare gear mentioned in the following list will be required to be carried, viz.:—

2 bolts and nuts (or studs and nuts) for each size of rotor bearing.
2 bolts and nuts (or studs and nuts) main gear wheel bearing.
2 bolts and nuts (or studs and nuts) pinion bearing.
1 set of coupling bolts of each size used.
One-twentieth of total number of bolts and nuts (or studs and nuts) for each gear case joint.
One-twentieth of total number for each Turbine casing joint.
2 thermometers for oil circulating system.
1 set of bearing bushes for one gear wheel shaft.
1 set of bearing bushes for rotor.
1 set of bearing bushes for pinion shafts.
One half set of packing rings or segments for each gland of rotor shafts so fitted and half the number of springs fitted.
2 ordinary thrust horseshoes (or thrust rings) for main thrust block, or sufficient pads for one face of Michell type of main thrust block.
Turbine thrust and adjusting bushes with rings complete, or one set of pads of Michell type for one turbine of each size fitted.
1 set of liners for adjusting block of different thicknesses.
1 set of feed pump valves.
1 set of bilge pump valves.
1 escape valve spring of each size fitted.
A quantity of assorted bolts, studs and nuts.
Bars and plates of iron or mild steel.

In addition to the foregoing, the following articles are recommended to be carried with a view to expedite repairs and lessen delay in distant ports, viz. :—

1 propeller of each hand, or one set of blades of each hand.
1 propeller shaft.
Lignum Vitæ lining for one stern bush.
Sufficient material for one gland and one dummy ring of each size where labyrinth packing is used.
1 air pump rod, bucket and valves.
1 water circulating pump rod, bucket and valves, or impeller and shaft.
2 doz. boiler tubes.
5% of the number of condenser tubes and packing glands for same.
10% of the tubes for oil cooler and packing glands for same.
1 set of boiler feed check valves.
1 set of safety valve springs.

PERIODICAL SURVEYS.

Section 38. The periodical surveys of the machinery and boilers are detailed on pages 20–21 under **Periodical Surveys of Main and Auxiliary Engines and Boilers, and Electric Fittings.**

By order of the Committee,

ANDREW SCOTT,
Secretary.

71, Fenchurch Street, London, E.C.3.
24th April, 1930.

RULES FOR THE CONSTRUCTION AND SURVEY OF PETROL AND PARAFFIN ENGINES.

GENERAL.

Section 1. In vessels propelled by Petrol or Paraffin Engines, the Rules as regards Machinery are the same as those relating to steam engines so far as regards the testing of material used in their construction and the fitting of sea connections, discharge pipes, shafting, stern tubes and propellers.

CONSTRUCTION.

Section 2. 1. The following points are to be observed in connection with the design of the engines.

2. The shaft bearings, connecting rod brasses, the valve gear, the inlet and exhaust valves are to be easily accessible.

3. The reversing gear and clutch are to be strongly constructed and easily accessible for examination and adjustment.

4. In engines of above 60 B.H.P. which are not reversible and which are manœuvred by clutch, a governor or other arrangement is to be fitted to prevent racing of the engine when de-clutched.

5. In vessels intended for open sea service and fitted with engines in which the lubricating oil is circulated under pressure, a spare oil pump is to be supplied with all connections ready for immediate use, and two independent means are to be arranged for circulating water through the oil cooler, where this is fitted.

6. If the engines are of the closed-in type, they are to be so fitted that the contained lubricating oil can be drained when necessary, and in wood vessels an easily drained metal or metal-lined tray is to be fitted to prevent leakage of either fuel oil or of lubricating oil from saturating the woodwork.

7. Carburettors, where petrol is used, and vaporizers, where paraffin is used, are to be so designed that when the engine is stopped the fuel supply is automatically shut off. If an overflow is provided in the carburettor or vaporizer, a gauze covered tray with means of draining it is to be fitted to prevent the fuel from flowing into the bilges.

Strong metallic gauze diaphragms are to be fitted either between the carburettor (or vaporizer) and cylinders, or at the air inlets.

8. If the ignition is electric, either by magneto or by coil and accumulator, all electric leads are to be well insulated and suitably protected from mechanical injury. The leads are not to be placed where they may be brought into contact with oil or petrol.

The commutator is to be enclosed, and the sparking coils are not to be placed where they can be exposed to explosive vapour.

9. In paraffin engines where lamps are used for ignition or for vaporizing, these lamps are to be fixed by some suitable bracket, and the flame enclosed when in use.

10. The water circulating pump sea suction is to have a cock or valve on the vessel's skin placed on the turn of the bilge in an easily accessible position, and the circulating pipe is to be provided with an efficient strainer which can be cleared inside the vessel. The discharge overboard is to be fitted with a cock or valve on the vessel's skin if it is situated under or near the load line of the vessel.

11. (*a*) The pumping arrangements are to be the same as would be required for steam vessels of similar size and power, with the exception that a bilge suction need not be fitted to the main engine water circulating pump. In the cases of vessels fitted with water ballast, the water ballast pump is to be fitted with a direct suction from the engine room bilges.

(*b*) In open launches and in auxiliary vessels not greater than 80 feet Rule length, power pump suctions may be dispensed with, provided manual pumps be fitted for the purpose of efficiently draining each compartment which is situated below the upper deck.

The manual pumps are to be workable from the upper deck, and the tail pipes are to be fitted with suction roses.

The inside diameters of the tail pipes of manual pumps are to be $\frac{1}{4}$ inch for every 25 feet of the Rule length plus one inch. No tail pipe is, however, to be less than $1\frac{1}{4}$ inches or need be more than $2\frac{1}{2}$ inches bore, except in vessels not greater than 25 feet Rule length, where they may be 1 inch bore.

The diameters of the barrels of manual pumps are to be twice the diameter of their tail pipes.

12. Where the cylinder liners are made of hard close grained cast iron of plain cylindrical form, accurately turned on the outside as well as bored on the inside, so that their soundness can be ascertained by inspection, they need not be hydraulically tested by internal pressure. If, however, they are made of complicated form, the question of testing is to be submitted.

13. The water jackets of the cylinders, and the water passages of the cylinder covers and pistons are to be tested by hydraulic pressure to 30 lbs. per square inch and are to be perfectly tight at that pressure.

14. The exhaust pipes and silencer are to be efficiently water cooled or lagged to prevent damage by heat, and if the exhaust is led overboard near the water-line, means are to be provided to prevent water from being syphoned back to the engine.

15. If compressed air receivers are fitted, they are to comply with the requirements of **Section 6 (Rules for Heavy Oil Engines).**

16. The machinery is to be tried under full working conditions, the report stating the approximate speed of vessel, the number of revolutions of the engines at full power, both ahead and astern, and the lowest number of revolutions of the engines which can be maintained for manœuvring purposes.

RULES FOR DETERMINING SIZES OF SHAFTS.

Section 3. 1.—(*a*) The crank, intermediate and other shafts, if of ordinary mild steel having a tensile breaking strength of 28–32 tons per square inch, are to be of not less diameters than those given by the following formulæ.

(*b*) Where shafts are proposed to be made of special high tensile steel, their sizes should be submitted for consideration.

2. **Crank Shafts.**—The diameter of the crank shaft of the main engines is not to be less than that given by the following formula :—

$$\left.\begin{array}{l}\text{Diameter of crank}\\ \text{shaft, in inches}\\ \text{or millimetres}\end{array}\right\} = \sqrt[3]{D^2 \times (A\,S + B\,L)}$$

where D = diameter of cylinder, in inches or millimetres,

S = length of stroke, in inches or millimetres,

L = span of bearings adjacent to a crank, measured from inner edge to inner edge, in inches or millimetres.

The values of A and B given in Table I. apply to engines in which there are bearings adjacent to each side of each crank. If there are two cranks between consecutive bearings the same Rules will apply, but L will be the span of bearings from inner edge to inner edge adjacent to the two cranks.

TABLE I.

4 Cycle Single Acting Engines.	2 Cycle Single Acting Engines.	For Smooth Water Service Values of		For Open Sea Service Values of	
		A	B	A	B
1,2,3 or 4 Cyls.	1 or 2 Cyls.	·025	·022	·028	·024
6 „	3 „	·031	·021	·034	·023
8 „	4 „	·035	·020	·039	·022
12 „	6 „	·048	·017	·053	·019

3. For engines of the aforementioned types driving auxiliary machinery, the diameters of the crank shafts may be 5 per cent less than given by the foregoing formula applying to main engines for open sea service.

4. **Crank Webs.**—In solid forged shafts the breadth of the webs should not be less than 1·33, and the thickness not less than ·56 times the diameter of the shaft as found by the foregoing formula or if these proportions are departed from, the webs are to be of equivalent strength.

5. **Intermediate Shafts.**—The diameter of the intermediate shafts is not to be less than that given by the following formula :—

$$\text{Diameter of intermediate shaft, in inches or millimetres} \ldots = C \sqrt[3]{D^2 \times S}$$

where D = diameter of cylinder, in inches or millimetres,

S = length of stroke, in inches or millimetres,

C is a coefficient found from Table II. by interpolation from the values found for A :—

$$A = \frac{D^2 \times S}{W \times d^2 \times R^2}$$

where D = diameter of cylinder, in inches,

S = length of stroke, in inches,

d = diameter of fly wheel, in feet,

R = revolutions of engines per minute,

W = total weight of fly wheel, in tons.

TABLE II.

FOR SMOOTH WATER SERVICE.				
4 Cycle Single Acting Engines.	2 Cycle Single Acting Engines.	Values of the Coefficient C where		
		A=·0025	A=·0050	A=·0100
2 Cyl.	1 Cyl.	·240	·250	·256
3 „	—	·255	·264	·270
4 „	2 „	·272	·277	·282
6 „	3 „	·298	·301	·304
8 „	4 „	·322	·324	·325
12 „	6 „	·363	·364	·365
FOR OPEN SEA SERVICE.				
4 Cycle Single Acting Engines.	2 Cycle Single Acting Engines.	Values of the Coefficient C where		
		A=·0025	A=·0050	A=·0100
2 Cyl.	1 Cyl.	·252	·262	·269
3 „	—	·269	·276	·283
4 „	2 „	·286	·291	·296
6 „	3 „	·313	·316	·319
8 „	4 „	·338	·340	·341
12 „	6 „	·382	·382	·383

6. If a separate fly wheel shaft is fitted its diameter is to be at least equal to that of the crank shaft.

7. **Thrust Shafts.**—The diameter at the collars of thrust shafts transmitting torque is not to be less than 1·05 times that required for the intermediate shaft. Thrust shafts may be tapered down outside the collars to the diameter required for the intermediate shaft.

8. **Tube Shafts** (shafts passing through stern tubes but not carrying the screw propellers).—The diameter of the tube shaft is not to be less than 1·05 times that required for the intermediate shaft, and any part of the shaft within the tube which may be exposed to sea water is not to be less than 1·075 times that required for the intermediate shaft.

9. **Screw Shafts** (shafts carrying the screw propellers). —(*a*) The diameter of the screw shaft is not to be less than that given by the following formula :—

$$\text{Diameter of screw shaft, in inches or millimetres} = d + \frac{P}{C}$$

where d is the diameter required for the intermediate shaft, in inches or millimetres,

P is the diameter of the propeller, in inches or millimetres,

C = 144 when the shaft is fitted with a continuous liner, or

C = 100 when the shaft is not fitted with a continuous liner.

(*b*) Screw shafts which run in stern tubes may have the end forward of the stern gland tapered down to a diameter, at the coupling flange, of 1·05 times d.

10. **Bronze Liners on Shafts.**—(*a*) The thickness of liners fitted on screw shafts, or on tube shafts, in way of the bushes, is not to be less than that given by the following formulæ :—

$$t = \frac{d + 9{\cdot}25}{32} \quad \text{or} \quad t_m = \frac{d + 235}{32}$$

where t is the thickness of the liner, in inches,

t_m is the thickness of the liner, in millimetres,

d is the diameter required for the screw or tube shaft under the liner, in inches or millimetres.

(*b*) The thickness of a continuous liner between the bushes is not to be less than $\frac{3}{4}t$ or $\frac{3}{4}t_m$.

(*c*) Continuous liners should be cast in one piece or, if made of two or more lengths, the junctions of the separate pieces are to be made by fusion through the whole thickness of the liner.

(*d*) Liners are to be carefully shrunk on, or forced on to the shafts by hydraulic pressure. Pins are not to be used to secure the liners.

(*e*) If the liner does not fit tightly between the bearings in the stern tube, the space between the shaft and the liner is to be charged or forced with a plastic material insoluble in water and non-corrosive.

(*f*) Effective means are to be provided for preventing water from having access to the shaft at the part between the after end of the liner and the propeller boss.

11. **Stern Bush.**—The length of the bearing in the stern bush next to and supporting the propeller is not to be less than 4 times the diameter required for the screw shaft under the liner.

12. **Couplings.**—(*a*) The diameter of the coupling bolts at the joining faces of the couplings is not to be less than that given by the following formula :—

$$\left.\begin{array}{l}\text{Diameter of coupling bolts,}\\ \text{in inches or millimetres ...}\end{array}\right\} = \sqrt{\frac{d^3}{3{\cdot}5 \times n \times r}}$$

where d is the diameter required for the intermediate shafts, in inches or millimetres,

n is the number of bolts in the coupling,

r is the radius of the pitch circle of the bolts, in inches or millimetres.

(*b*) The thickness of the coupling flanges at the pitch circle of the bolt holes is not to be less than the diameter of the coupling bolts, at the face of the coupling. The thickness of the screw shaft coupling flange is not to be less than ·25 of the diameter required for the intermediate shaft.

(*c*) The radius of curvature at the fillet where the flange starts from the shaft should not be less than ·125 times the diameter of the shaft adjacent to the flange.

(*d*) Where couplings are separate from the shafts, provision is to be made to resist the astern pull.

71, Fenchurch Street, London, E.C.3.
12*th December*, 1929.

PETROL AND PARAFFIN TANKS AND CONNECTIONS.

Section 4. 1. All fuel tanks and their fittings are to be in accordance with **Section 20** (**Rules for Steel Ships**), as far as applicable.

2. Strong and readily removable metallic gauze diaphragms are to be fitted at all openings on petrol tanks.

3. Glass gauges are not to be fitted to fuel tanks containing either petrol or paraffin.

4. Filling pipes are to be carried through the deck so that the gas displaced from the tanks has free escape to the atmosphere.

5. Separate fuel tanks are to be provided with metal or metal-lined trays to prevent any possible leakage from them flowing into the bilges, or saturating woodwork. Arrangements are to be provided for emptying the tanks and draining the trays beneath them. For petrol tanks the trays are to be fitted with drains leading overboard where possible or they are to be gauze-covered trays with means for draining them.

6. All petrol or paraffin fuel pipes are to be of annealed seamless copper with flexible bends. Their joints are to be conical, metal to metal. A cock or valve is to be fitted at each end of the pipe conveying the fuel from the tank to the carburettor or vaporizer. The fuel pipes are to be led in positions where they are protected from mechanical injury and can be exposed to view throughout their whole length.

7. The engine room, and the compartment in which the fuel tanks are situated, are to be efficiently ventilated.

8. An approved fire extinguishing apparatus is to be supplied.

PERIODICAL SURVEYS.

Section 5. The periodical surveys of the machinery are detailed on pages 21 and 22 under "**Petrol, Paraffin, and Heavy Oil Engines.**"

By order of the Committee,
ANDREW SCOTT,
Secretary.

RULES FOR THE CONSTRUCTION AND SURVEY OF HEAVY OIL ENGINES AND THEIR AUXILIARIES.

GENERAL.

Section 1. In vessels propelled by Heavy Oil Engines, the Rules as regards Machinery are the same as those relating to steam engines, so far as regards the testing of material used in their construction and the fitting of sea connections, discharge pipes, shafting, stern tubes, and propellers.

CONSTRUCTION.

Section 2. 1. In vessels built under Special Survey and fitted with heavy oil engines, the engines are also to be constructed under Special Survey.

2. In cases of heavy oil engines being built under Special Survey, the distinguishing mark ✠ will be noted in Red, thus :—✠LMC or ✠NE.

3. In order to facilitate the inspection, the plans of the machinery are to be examined by the Surveyors, and the dimensions of the shafts are to be submitted for approval.

4. The Surveyors are to examine the materials and workmanship from the commencement of the work until the final test of the machinery under full power working conditions ; any defects are to be pointed out as early as possible.

5. Any novelty in the construction of the machinery is to be reported to the Committee and submitted for approval.

6. The auxiliary engines used for air compressing, working dynamos and ballast, or other, pumps, are also to be surveyed during construction.

SINGLE ACTING ENGINES.

Rules for Determining Sizes of Shafts.

Section 3. 1.—(*a*) The crank, intermediate and other shafts, if of ordinary mild steel having a tensile breaking strength of 28–32 tons per square inch, are to be of not less diameters than those given by the following formulæ.

(*b*) Where shafts are proposed to be made of special high tensile steel, their sizes should be submitted for consideration.

2. **Crank Shafts.**—The diameter of the crank shaft of the main engines is not to be less than that given by the following formula :—

$$\left.\begin{array}{l}\text{Diameter of crank}\\ \text{shaft, in inches}\\ \text{or millimetres}\end{array}\right\} = \sqrt[3]{D^2 \times (AS + BL)}$$

where D = diameter of cylinder, in inches or millimetres,

S = length of stroke, in inches or millimetres,

L = span of bearings adjacent to a crank, measured from inner edge to inner edge, in inches or millimetres.

A and B are coefficients dependent upon the designed maximum and mean indicated pressures and are found from Table I.

Where the designed maximum pressure and/or the designed mean indicated pressure are intermediate between the standard pressures given in Table I., the coefficients A and B are to be found by interpolation between those given in the Table.

TABLE I. FOR CRANK SHAFTS OF SINGLE ACTING ENGINES.

4 Cycle Single Acting Engines. — Number of Cylinders.	2 Cycle Single Acting Engines. — Number of Cylinders.	Values of Coefficients.									
		Maximum Pressure 300 lbs. per sq. inch.				Maximum Pressure 400 lbs. per sq. inch.					
		M.I.P. 40 lbs. per sq. inch.		M.I.P. 60 lbs. per sq. inch.		M.I.P. 40 lbs. per sq. inch.		M.I.P. 60 lbs. per sq. inch.		M.I.P. 80 lbs. per sq. inch.	
		A	B	A	B	A	B	A	B	A	B
1, 2, 3 or 4	1 or 2	·017	·031	·026	·031	·013	·062	·025	·058	·036	·054
5 or 6	3	·027	·028	·036	·028	·025	·058	·038	·054	·050	·050
7 or 8	4	·028	·028	·040	·028	·026	·058	·040	·054	·061	·048
9 or 10	5	·030	·027	·044	·027	·028	·056	·048	·051	·068	·047
11 or 12	6	·031	·027	·045	·027	·027	·058	·051	·051	·070	·046
—	7	·033	·027	·049	·027	·034	·054	·058	·049	·076	·045
—	8	·036	·027	·053	·027	·038	·054	·064	·048	·079	·045
—	9	·041	·026	·058	·026	·043	·051	·070	·046	·090	·042
—	10	·045	·024	·065	·024	·045	·051	·072	·046	·099	·041
—	11	·044	·026	·064	·026	·046	·053	·074	·046	·104	·041
—	12	·045	·026	·067	·026	·047	·053	·076	·046	·109	·040
—	4 2 Firing together.	·040	·026	·057	·026	·036	·054	·059	·049	·085	·043
—	6 2 Firing together.	·045	·024	·061	·024	·041	·053	·069	·046	·093	·042
—	8 2 Firing together.	·064	·022	·086	·022	·060	·049	·096	·043	·133	·038
—	10 2 Firing together.	·071	·022	·094	·022	·074	·046	·112	·040	·142	·037
—	12 2 Firing together.	·065	·022	·091	·022	·073	·046	·112	·040	·147	·037

TABLE I.—*continued.* FOR CRANK SHAFTS OF SINGLE ACTING ENGINES.

4 Cycle Single Acting Engines. — Number of Cylinders.	2 Cycle Single Acting Engines. — Number of Cylinders.	Values of Coefficients. Maximum Pressure 500 to 700 lbs. per sq. inch.													
		M.I.P. 40 lbs. per sq. inch.		M.I.P. 60 lbs. per sq. inch.		M.I.P. 80 lbs. per sq. inch.		M.I.P. 100 lbs. per sq. inch.		M.I.P. 120 lbs. per sq. inch.		M.I.P. 140 lbs. per sq. inch.		M.I.P. 160 lbs. per sq. inch.	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B
1,2,3 or 4	1 or 2	·030	·067	·046	·067	·061	·067	·076	·067	·089	·067	·099	·067	·108	·067
5 or 6	3	·042	·064	·059	·064	·070	·064	·082	·064	·096	·064	·111	·064	·120	·064
7 or 8	4	·045	·062	·062	·062	·079	·062	·092	·062	·110	·062	·127	·062	·143	·062
9 or 10	5	·047	·061	·064	·061	·082	·061	·101	·061	·121	·061	·135	·061	·150	·061
11 or 12	6	·049	·061	·066	·061	·084	·061	·103	·061	·123	·061	·137	·061	·153	·061
—	7	·051	·061	·068	·061	·086	·061	·106	·061	·125	·061	·140	·061	·156	·061
—	8	·053	·061	·070	·061	·088	·061	·109	·061	·128	·061	·148	·061	·165	·061
—	9	·059	·058	·080	·058	·101	·058	·122	·058	·144	·058	·163	·058	·181	·058
—	10	·064	·057	·088	·057	·112	·057	·134	·057	·157	·057	·178	·057	·198	·057
—	11	·066	·056	·091	·056	·115	·056	·139	·056	·161	·056	·182	·056	·203	·056
—	12	·069	·056	·093	·056	·119	·056	·147	·056	·178	·056	·202	·056	·223	·056
—	4 2 Firing together.	·076	·054	·105	·054	·136	·054	·160	·054	·183	·054	·206	·054	·232	·054
—	6 2 Firing together.	·078	·053	·107	·053	·140	·053	·164	·053	·187	·053	·210	·053	·237	·053
—	8 2 Firing together.	·097	·050	·133	·050	·170	·050	·203	·050	·229	·050	·258	·050	·292	·050
—	10 2 Firing together.	·107	·049	·141	·049	·175	·049	·208	·049	·242	·049	·268	·049	·303	·049
—	12 2 Firing together.	·090	·051	·126	·051	·161	·051	·196	·051	·222	·051	·248	·051	·286	·051

For heavy oil engines, with not more than three cylinders, driving auxiliary machinery the diameters of the crankshafts may be five per cent less than given by the foregoing formula.

3. **Crank Webs of Solid Forged Shafts.**—In solid forged shafts the breadth of the webs should not be less than 1·33 times and the thickness not less than ·56 times the diameter of the shaft as found by the foregoing formula, or, if these proportions are departed from, the webs are to be of equivalent strength.

4. **Crank Webs of Built Shafts.**— (*a*) The dimensions of the crank webs of built shafts are not to be less than those given by the following formulæ :—

$$h = \cdot 625 \times d$$

$$t = \sqrt{\frac{\cdot 12 \times d^3}{h}}$$

where h is the thickness of the web, measured parallel to the axis, in inches or millimetres,

t is the thickness of metal around the eyeholes, measured radially, in inches or millimetres,

d is the diameter required for the crank shaft, in inches or millimetres.

(*b*) Crank webs are to be securely shrunk on the body pieces and crank pins, or to be forced on by hydraulic pressure. One or two keys or cylindrical dowels are to be fitted at the junction of the body pieces and webs.

On the application of Owners, the Committee will be prepared to give consideration to the circumstances of any special case.

5. **Intermediate Shafts.**—The diameter of the intermediate shafts is not to be less than that given by the formulæ :—

For engines having a maximum pressure under 350 lbs. per square inch. Diameter of intermediate shaft, in inches $= C \sqrt[3]{\frac{B.H.P.}{R}}$ (Table II.)

For engines having a maximum pressure of 350 and under 500 lbs. per square inch. Diameter of intermediate shaft, in inches $= C \sqrt[3]{\frac{B.H.P.}{R}}$ (Table III.)

For engines having a maximum pressure of 500 to 700 lbs. per square inch. Diameter of intermediate shaft, in inches $= C \sqrt[3]{\frac{B.H.P.}{R}}$ (Table IV.)

where **B.H.P.** = designed maximum brake horse power.

R = revolutions of engines per minute.

C is a coefficient found from Tables II. or III., by interpolation from the values found for **A**, or from Table IV. by interpolation from the values found for **A** and the piston speeds.

In using Tables II., III. and IV. the appropriate value of **A** is found thus :—

$$A = \frac{D^2 \times S}{W \times d^2 \times R^2}$$

where **D** = diameter of cylinder, in inches,
S = length of stroke, in inches,
d = diameter of fly wheel, in feet,
R = revolutions of engines per minute,
W = total weight of fly wheel, in tons.

Where a fly wheel is not fitted, but where there are special balance weights at the crank webs, the value of **A** may be found from the formula :—

$$A = \frac{D^2 \times S}{6 \cdot 24 \times w \times r^2 \times R^2}$$

where **D** = diameter of cylinder, in inches,
S = length of stroke, in inches,
r = radius of gyration of balance weights, in feet,
R = revolutions of engines per minute,
w = total weight of balance weights, in tons.

Where a flywheel and special balance weights are fitted, the value of **A** may be found from the formula :—

$$A = \frac{D^2 \times S}{(6 \cdot 24 \times wr^2 + Wd^2) \times R^2}$$

6. **Fly Wheel Shaft.**—The diameter of the fly wheel shaft is to be at least equal to that of the crank shaft.

7. **Thrust Shafts.**—The diameter at the collars of thrust shafts transmitting torque is not to be less than 1·05 times that required for the intermediate shaft. Thrust shafts may be tapered down outside the collars to the diameter required for the intermediate shaft.

8. **Tube Shafts** (Shafts passing through stern tubes but not carrying the screw propellers).—The diameter of the tube shaft is not to be less than 1·05 times that required for the intermediate shaft, and any part of the shaft within the tube which may be exposed to sea water is not to be less than 1·075 times that required for the intermediate shaft.

9. **Screw Shafts** (Shafts carrying the screw propellers).—(*a*) The diameter of the screw shaft is not to be less than that given by the following formula :—

$$\text{Diameter of screw shaft, in inches or millimetres} = d + \frac{P}{C}$$

where d is the diameter required for the intermediate shafts, in inches or millimetres,

P is the diameter of the propeller, in inches or millimetres,

C = 144 when the shaft is fitted with a continuous liner, or

C = 100 when the shaft is not fitted with a continuous liner.

(*b*) Screw shafts which run in stern tubes may have the end forward of the stern gland tapered down to a diameter, at the coupling flange, of 1·05 times d.

10. **Bronze Liners on Shafts.**—(*a*) The thickness of liners fitted on screw shafts or on tube shafts, in way of the bushes, is not to be less than that given by the following formulæ :—

$$t = \frac{d + 9{\cdot}25}{32} \quad \text{or} \quad t_m = \frac{d + 235}{32}$$

where t is the thickness of the liner, in inches,

t_m is the thickness of the liner, in millimetres,

d is the diameter required for the screw or tube shaft under the liner, in inches or millimetres.

(*b*) The thickness of a continuous liner between the bushes is not to be less than $\frac{3}{4}t$ or $\frac{3}{4}t_m$.

(*c*) Continuous liners should be cast in one piece, or, if made of two or more lengths, the junctions of the separate pieces are to be made by fusion through the whole thickness of the liner.

(*d*) Liners are to be carefully shrunk on, or forced on to the shafts by hydraulic pressure. Pins are not to be used to secure the liners.

(*e*) If the liner does not fit tightly between the bearings in the stern tube, the space between the shaft and the liner is to be charged or forced with a plastic material insoluble in water and non-corrosive.

(*f*) Effective means are to be provided for preventing water from having access to the shaft at the part between the after end of the liner and the propeller boss.

11. **Stern Bush.**—The length of the bearing in the stern bush next to and supporting the propeller, is not to be less than 4 times the diameter required for the screw shaft under the liner.

12. **Couplings.**—(*a*) The diameter of the coupling bolts at the joining faces of the couplings is not to be less than that given by the following formula :—

$$\left.\begin{array}{l}\text{Diameter of coupling bolts,}\\ \text{in inches or millimetres...}\end{array}\right\} = \sqrt{\frac{d^3}{3{\cdot}5 \times n \times r}}$$

where d is the diameter required for the intermediate shafts, in inches or millimetres,

n is the number of bolts in the coupling,

r is the radius of the pitch circle of the bolts, in inches or millimetres,

(*b*) The thickness of the coupling flanges at the pitch circle of the bolt holes is not to be less than the diameter of the coupling bolts, at the face of the coupling. The thickness of the screw shaft coupling flange is not to be less than ·25 of the diameter required for the intermediate shaft.

(*c*) The radius of the curvature at the fillet where the flange starts from the shaft, should not be less than ·125 times the diameter of the shaft adjacent to the flange.

(*d*) Where couplings are separate from the shafts, provision is to be made to resist the astern pull.

TABLE II. FOR INTERMEDIATE SHAFTS OF SINGLE ACTING ENGINES.

MAXIMUM PRESSURE UNDER 350 LBS. PER SQ. INCH.

4 Cycle Single Acting Engines. — Number of Cylinders.	2 Cycle Single Acting Engines. — Number of Cylinders.	Values of Coefficient C where A = ·0015	A = ·0025	A = ·005	A = ·010	A = ·015	No Fly Wheel or Balance Weights
1 or 2	1	4·26	4·48	5·02	5·92	—	—
3 or 4	2	4·17	4·20	4·25	4·38	4·55	5·96
5 or 6	3	4·15	4·17	4·20	4·26	4·35	4·90
7 or 8	4	4·10	4·13	4·16	4·24	4·32	4·77
9 or 10	5	4·07	4·07	4·09	4·14	4·18	4·34
11 or 12	6	4·06	4·06	4·06	4·08	4·10	4·18
—	7	4·05	4·05	4·05	4·06	4·06	4·09
—	8	4·04	4·04	4·04	4·04	4·04	4·04
—	9	4·03	4·03	4·03	4·03	4·03	4·03
—	10	4·03	4·03	4·03	4·03	4·03	4·03
—	11	4·02	4·02	4·02	4·02	4·02	4·02
—	12	4·02	4·02	4·02	4·02	4·02	4·02
—	4 2 Firing together.	4·13	4·20	4·38	4·67	4·87	5·85
—	6 2 Firing together.	4·12	4·19	4·32	4·50	4·63	5·13
—	8 2 Firing together.	4·10	4·15	4·24	4·36	4·43	4·70
—	10 2 Firing together.	4·07	4·10	4·15	4·22	4·27	4·39
—	12 2 Firing together.	4·04	4·05	4·08	4·11	4·12	4·16

TABLE III. FOR INTERMEDIATE SHAFTS OF SINGLE ACTING ENGINES.

MAXIMUM PRESSURE 350 AND UNDER 500 LBS. PER SQ. INCH.

4 Cycle Single Acting Engines. — Number of Cylinders.	2 Cycle Single Acting Engines. — Number of Cylinders.	Values of coefficient C where					
		A = ·0015	A = ·0025	A = ·005	A = ·010	A = ·015	No fly wheel or balance weights.
1 or 2	1	4·33	4·59	5·23	6·31	—	—
3 or 4	2	4·19	4·24	4·34	4·59	4·83	6·67
5 or 6	3	4·16	4·18	4·22	4·32	4·42	5·08
7 or 8	4	4·10	4·14	4·18	4·30	4·40	4·90
9 or 10	5	4·07	4·08	4·11	4·17	4·21	4·42
11 or 12	6	4·06	4·06	4·08	4·11	4·13	4·23
—	7	4·05	4·05	4·06	4·08	4·10	4·16
—	8	4·04	4·04	4·04	4·04	4·04	4·06
—	9	4·03	4·03	4·03	4·03	4·03	4·03
—	10	4·03	4·03	4·03	4·03	4·03	4·03
—	11	4·02	4·02	4·02	4·02	4·02	4·02
—	12	4·02	4·02	4·02	4·02	4·02	4·02
—	4 2 Firing together.	4·19	4·29	4·59	5·00	5·26	6·55
—	6 2 Firing together.	4·18	4·23	4·41	4·66	4·81	5·41
—	8 2 Firing together.	4·12	4·18	4·28	4·43	4·51	4·80
—	10 2 Firing together.	4·10	4·12	4·18	4·27	4·31	4·43
—	12 2 Firing together.	4·05	4·07	4·10	4·14	4·15	4·20

TABLE IV. FOR INTERMEDIATE SHAFTS OF SINGLE ACTING ENGINES.

MAXIMUM PRESSURE 500 TO 700 LBS. PER SQ. INCH.

2 Cycle Single Acting Engines.

NUMBER OF CYLINDERS.	VALUES OF A.	Values of Coefficient C for the following Piston Speeds in feet per Minute.			
		700 and below.	850	1000	1200 and above.
1 or 2	·0015	4·45	4·41	4·39	4·37
	·0025	4·75	4·70	4·64	4·58
	·005	5·40	5·26	5·11	4·96
3	·0015	4·22	4·21	4·20	4·18
	·0025	4·37	4·33	4·29	4·26
	·005	4·70	4·55	4·49	4·40
	·010	5·14	4·88	4·69	4·54
4	·0015	4·14	4·13	4·12	4·11
	·0025	4·22	4·19	4·17	4·15
	·005	4·38	4·31	4·25	4·21
	·010	4·61	4·47	4·33	4·26
	·015	4·75	4·52	4·38	4·28
5	·0015	4·07	4·07	4·07	4·05
	·0025	4·11	4·09	4·09	4·07
	·005	4·18	4·15	4·11	4·09
	·010	4·28	4·21	4·14	4·10
	·015	4·33	4·24	4·16	4·11
	No Fly Wheel or Balance Weights.	4·47	4·32	4·21	4·13
6	·0015 to ·010	4·06	4·06	4·06	4·06
	·015	4·10	4·06	4·06	4·06
	No Fly Wheel or Balance Weights.	4·15	4·06	4·06	4·06
7	All Values including No Fly Wheel or Balance Weights.	4·05	4·05	4·05	4·05
8	,,	4·04	4·04	4·04	4·04
9	,,	4·03	4·03	4·03	4·03
10	,,	4·03	4·03	4·03	4·03
11	,,	4·02	4·02	4·02	4·02
12	,,	4·02	4·02	4·02	4·02
4 2 Firing together.	·0015	4·87	4·78	4·70	4·63
	·0025	5·35	5·18	5·02	4·87
	·005	6·16	5·77	5·45	5·19
6 2 Firing together.	·0015	4·43	4·37	4·30	4·26
	·0025	4·66	4·54	4·46	4·36
	·005	5·06	4·79	4·61	4·48
	·010	5·41	5·02	4·74	4·55
8 2 Firing together.	·0015	4·24	4·20	4·17	4·15
	·0025	4·32	4·27	4·22	4·18
	·005	4·53	4·38	4·27	4·21
	·010	4·70	4·48	4·32	4·24
	·015	4·78	4·50	4·34	4·25
	No Fly Wheel or Balance Weights.	4·99	4·60	4·39	4·27
10 2 Firing together.	·0015	4·12	4·09	4·08	4·07
	·0025	4·16	4·13	4·10	4·08
	·005	4·24	4·18	4·13	4·08
	·010	4·32	4·21	4·15	4·10
	·015	4·35	4·22	4·16	4·10
	No Fly Wheel or Balance Weights.	4·42	4·25	4·17	4·12
12 2 Firing together.	·0015 to ·005	4·06	4·05	4·04	4·03
	·010, ·015 and No Fly Wheel or Balance Weights.	4·11	4·06	4·05	4·04

4 Cycle Single Acting Engines.

NUMBER OF CYLINDERS.	VALUES OF A.	Values of Coefficient C for the following Piston Speeds in feet per Minute.			
		700 and below.	850	1000	1200 and above.
1, 2, 3 or 4	·0015	4·40	4·36	4·33	4·29
	·0025	4·66	4·59	4·50	4·45
	·005	5·16	4·95	4·78	4·64
	·010	5·72	5·34	5·05	4·81
5	·0015	4·27	4·26	4·23	4·21
	·0025	4·42	4·38	4·33	4·27
	·005	4·77	4·61	4·48	4·38
	·010	5·10	4·83	4·61	4·48
6	·0015	4·20	4·18	4·16	4·14
	·0025	4·30	4·26	4·22	4·19
	·005	4·52	4·40	4·30	4·24
	·010	4·75	4·53	4·38	4·28
	·015	4·88	4·60	4·43	4·30
	No Fly Wheel or Balance Weights.	5·27	4·78	4·52	4·35
7	·0015	4·17	4·14	4·13	4·12
	·0025	4·24	4·21	4·18	4·16
	·005	4·36	4·30	4·23	4·19
	·010	4·53	4·36	4·28	4·21
	·015	4·63	4·40	4·30	4·22
	No Fly Wheel or Balance Weights.	4·87	4·52	4·34	4·24
8	·0015	4·13	4·11	4·10	4·08
	·0025	4·18	4·15	4·12	4·10
	·005	4·27	4·21	4·16	4·13
	·010	4·37	4·25	4·19	4·14
	·015	4·43	4·27	4·20	4·15
	No Fly Wheel or Balance Weights.	4·58	4·34	4·23	4·17
9	·0015	4·10	4·09	4·08	4·07
	·0025	4·14	4·11	4·10	4·08
	·005	4·20	4·16	4·12	4·10
	·010	4·26	4·18	4·13	4·11
	·015	4·29	4·19	4·14	4·11
	No Fly Wheel or Balance Weights.	4·37	4·23	4·17	4·12
10	·0015 to ·015	4·13	4·09	4·06	4·06
	No Fly Wheel or Balance Weights.	4·22	4·14	4·10	4·06
11	All Values including No Fly Wheel or Balance Weights.	4·07	4·07	4·07	4·07
12	,,	4·05	4·05	4·05	4·05

DOUBLE ACTING ENGINES.

Rules for Determining Sizes of Shafts.

Section 4. 1.—(*a*) The crank, intermediate and other shafts, if of ordinary mild steel having a tensile breaking strength of 28–32 tons per square inch, are to be of not less diameters than those given by the following formulæ.

(*b*) Where shafts are proposed to be made of special high tensile steel, their sizes should be submitted for consideration.

2. **Crank Shafts.**—(*a*) Where the designed maximum and mean indicated pressures are 500 and 100 lbs. per square inch respectively, the diameter of the crankshaft of the main engines is not to be less than that given by the following formula:—

$$\left.\begin{matrix}\text{Diameter of crank}\\ \text{shaft, in inches}\\ \text{or millimetres}\end{matrix}\right\} = \sqrt[3]{D^2 \times (AS + BL)}$$

where **D** = diameter of cylinder, in inches or millimetres,

S = length of stroke, in inches or millimetres,

L = span of bearings adjacent to a crank, measured from inner edge to inner edge, in inches or millimetres.

A and **B** are coefficients found from **Table V.**

Where the designed maximum and mean indicated pressures are other than 500 and 100 lbs. per square inch respectively, or where special arrangements of cranks and firing orders are adopted, the sizes of the shafting will be specially considered.

TABLE V. FOR CRANK SHAFTS OF DOUBLE ACTING ENGINES.

500 LBS. PER SQ. INCH MAXIMUM PRESSURE AND 100 LBS. PER SQ. INCH MEAN INDICATED PRESSURE (TOP AND BOTTOM).

2 Cycle Double Acting Engines.				4 Cycle Double Acting Engines.				
Number of Cylinders.	Arrangement of Cranks.	Values of Coefficients.		Number of Cylinders.	Arrangement of Cranks.	Particulars of Firing.	Values of Coefficients.	
		A	B				A	B
1	—	·063	·044	1	—	—	·063	·044
2	—	·104	·038	2	—	—	·104	·038
3	—	·076	·042	3	—	—	·094	·039
4		·116	·037	4	—	—	·159	·034
4		·159	·034	6		No Simultaneous Firing.	·127	·037
5		·127	·036					
6		·141	·035					
6		·152	·034	8		Two Cylinder Ends Fire together.	·200	·032
7		·149	·034					
8		·189	·032	6		Two Cylinder Ends Fire together.	·185	·032
9		·196	·032					
6		·167	·033	8		Four Cylinder Ends Fire together.	·355	·028
8		·324	·028					

For heavy oil engines, with not more than three cylinders, driving auxiliary machinery the diameters of the crankshafts may be five per cent less than given by the foregoing formula.

3. **Crank Webs of Solid Forged Shafts.**—In solid forged shafts the breadth of the webs should not be less than 1·33 times and the thickness not less than ·56 times the diameter of the shaft as found by the foregoing formula, or, if these proportions are departed from, the webs are to be of equivalent strength.

4. **Crank Webs of Built Shafts.**—(*a*) The dimensions of the crank webs of built shafts are not to be less than those given by the following formulæ :—

$$h = \cdot 625 \times d$$

$$t = \sqrt{\frac{\cdot 12 \times d^3}{h}}$$

where h is the thickness of the web, measured parallel to the axis, in inches or millimetres,

t is the thickness of metal around the eyeholes, measured radially, in inches or millimetres,

d is the diameter required for the crank shaft, in inches or millimetres.

(*b*) Crank webs are to be securely shrunk on the body pieces and crank pins, or to be forced on by hydraulic pressure. One or two keys or cylindrical dowels are to be fitted at the junction of the body pieces and webs.

On the application of Owners, the Committee will be prepared to give consideration to the circumstances of any special case.

5. **Intermediate Shafts.**—Where the designed maximum and mean indicated pressures do not exceed 500 and 100 lbs. per square inch respectively, the diameter of the intermediate shaft is not to be less than that given by the formula :—

$$\left.\begin{array}{l}\text{Diameter of intermediate shaft,}\\ \text{in inches . ...}\end{array}\right\} = C\sqrt[3]{\frac{B.H.P.}{R}}$$

Where **B.H.P.** = Designed maximum brake horse power.

R = Revolutions of engines per minute.

C is a coefficient found from **Table VI.** by interpolation from the values found for **A** and the piston speeds.

In using **Table VI.** the appropriate value of **A** is found thus :—

$$A = \frac{D^2 \times S}{W \times d^2 \times R^2}$$

where **D** = diameter of cylinder, in inches

S = length of stroke, in inches,

d = diameter of fly wheel, in feet,

R = revolutions of engines per minute,

W = total weight of fly wheel, in tons.

Where a fly wheel is not fitted, but where there are special balance weights at the crank webs, the value of **A** may be found from the formula :—

$$A = \frac{D^2 \times S}{6 \cdot 24 \times w \times r^2 \times R^2}$$

where **D** = diameter of cylinder, in inches,

S = length of stroke, in inches,

r = radius of gyration of balance weights, in feet,

R = revolutions of engines per minute,

w = total weight of balance weights, in tons.

Where a fly wheel and special balance weights are fitted, the value of **A** may be found from the formula :—

$$A = \frac{D^2 \times S}{(6 \cdot 24 \times wr^2 + Wd^2) \times R^2}$$

TABLE VI. FOR INTERMEDIATE SHAFTS OF DOUBLE ACTING ENGINES.

500 LBS. PER SQ. INCH MAXIMUM PRESSURE AND 100 LBS. PER SQ. INCH MEAN INDICATED PRESSURE (TOP AND BOTTOM).

2 Cycle Double Acting Engines.

NUMBER OF CYLINDERS.	VALUES OF A.	VALUES OF COEFFICIENT C FOR THE FOLLOWING PISTON SPEEDS IN FEET PER MINUTE.			
		700 and below.	850	1000	1200 and above.
1	·0015	4·48	4·47	4·46	4·44
	·0025	4·82	4·79	4·75	4·71
2 Cranks at 90°	·0015	4·21	4·20	4·19	4·18
	·0025	4·35	4·31	4·28	4·26
	·005	4·68	4·58	4·50	4·43
	·010	5·15	4·92	4·74	4·59
2 Cranks at 180°	·0015	4·69	4·65	4·61	4·57
	·0025	5·14	5·06	4·95	4·86
3	·0015	4·11	4·11	4·10	4·09
	·0025	4·17	4·16	4·14	4·13
	·005	4·30	4·25	4·21	4·18
	·010	4·50	4·37	4·28	4·22
	·015	4·62	4·47	4·32	4·25
	No Fly Wheel or Balance Weights	5·15	4·70	4·47	4·31
4	·0015	4·20	4·18	4·16	4·15
	·0025	4·30	4·26	4·22	4·19
	·005	4·53	4·41	4·31	4·25
	·010	4·78	4·56	4·40	4·30
	·015	4·91	4·63	4·47	4·32
	No Fly Wheel or Balance Weights	5·35	4·84	4·55	4·38
5	·0015 to ·0025	4·05	4·04	4·04	4·04
	·005 to ·015	4·10	4·07	4·06	4·05
	No Fly Wheel or Balance Weights	4·16	4·10	4·07	4·06
6	·0015 to ·0025	4·06	4·05	4·04	4·04
	·005 to ·015	4·12	4·09	4·07	4·05
	No Fly Wheel or Balance Weights	4·16	4·11	4·08	4·06
7	All Values, including No Fly Wheel or Balance Weights.	4·04	4·04	4·04	4·04
8	,,	4·03	4·03	4·03	4·03
9	,,	4·02	4·02	4·02	4·02
6	·0015	4·19	4·17	4·15	4·13
	·0025	4·27	4·23	4·19	4·16
	·005	4·45	4·31	4·24	4·19
	·010	4·60	4·40	4·28	4·21
	·015	4·68	4·46	4·30	4·22
	No Fly Wheel or Balance Weights	4·91	4·54	4·35	4·25
8	·0015	4·32	4·26	4·21	4·18
	·0025	4·47	4·34	4·26	4·21
	·005	4·64	4·46	4·31	4·23
	·010	4·80	4·52	4·35	4·25
	·015	4·86	4·55	4·37	4·26
	No Fly Wheel or Balance Weights	5·03	4·62	4·40	4·28

4 Cycle Double Acting Engines.

NUMBER OF CYLINDERS.	VALUES OF A.	VALUES OF COEFFICIENT C FOR THE FOLLOWING PISTON SPEEDS IN FEET PER MINUTE.			
		700 and below.	850	1000	1200 and above.
1	·0015	4·59	4·57	4·55	4·52
	·0025	5·01	4·96	4·91	4·85
2 Cranks at 90°	·0015	4·54	4·52	4·47	4·44
	·0025	4·89	4·81	4·73	4·64
2 Cranks at 180°	·0015	4·97	4·91	4·85	4·78
	·0025	5·54	5·41	5·27	5·15
3	·0015	4·53	4·48	4·45	4·39
	·0025	4·86	4·75	4·65	4·56
	·005	5·45	5·20	4·98	4·80
4	·0015	4·69	4·61	4·53	4·47
	·0025	5·11	4·89	4·74	4·62
	·005	5·65	5·24	5·03	4·81
6 No Simultaneous Firing.	·0015	4·09	4·08	4·07	4·06
	·0025	4·13	4·10	4·09	4·07
	·005	4·18	4·14	4·11	4·08
	·010	4·23	4·17	4·12	4·09
	·015	4·26	4·18	4·13	4·10
	No Fly Wheel or Balance Weights	4·34	4·21	4·14	4·11
8 2 Cylinder Ends Fire together.	·0015	4·15	4·13	4·10	4·08
	·0025	4·20	4·16	4·13	4·10
	·005	4·28	4·20	4·15	4·12
	·010	4·35	4·23	4·17	4·13
	·015	4·38	4·24	4·18	4·13
	No Fly Wheel or Balance Weights	4·48	4·27	4·19	4·14
6 2 Cylinder Ends Fire together.	·0015	4·92	4·78	4·65	4·53
	·0025	5·31	5·06	4·84	4·67
8 4 Cylinder Ends Fire together.	·0015	5·07	4·84	4·67	4·53
	·0025	5·39	5·07	4·80	4·62

6. **Fly Wheel Shaft.**—The diameter of the fly wheel shaft is to be at least equal to that of the crank shaft.

7. **Thrust Shafts.**—The diameter at the collars of thrust shafts transmitting torque is not to be less than 1·05 times that required for the intermediate shaft. Thrust shafts may be tapered down outside the collars to the diameter required for the intermediate shaft.

8. **Tube Shafts** (Shafts passing through stern tubes but not carrying the screw propellers).—The diameter of the tube shaft is not to be less than 1·05 times that required for the intermediate shaft, and any part of the shaft within the tube which may be exposed to sea water is not to be less than 1·075 times that required for the intermediate shaft.

9. **Screw Shafts** (Shafts carrying the screw propellers).—(*a*) The diameter of the screw shaft is not to be less than that given by the following formula:—

$$\text{Diameter of screw shaft, in inches or millimetres} = d + \frac{P}{C}$$

where d is the diameter required for the intermediate shafts, in inches or millimetres,

P is the diameter of the propeller, in inches or millimetres,

C = 144 when the shaft is fitted with a continuous liner, or

C = 100 when the shaft is not fitted with a continuous liner.

(*b*) Screw shafts which run in stern tubes may have the end forward of the stern gland tapered down to a diameter, at the coupling flange, of 1·05 times d.

10. **Bronze Liners on Shafts.**—(*a*) The thickness of liners fitted on screw shafts or on tube shafts, in way of the bushes, is not to be less than that given by the following formulæ:—

$$t = \frac{d + 9{\cdot}25}{32} \quad \text{or} \quad t_m = \frac{d + 235}{32}$$

where t is the thickness of the liner, in inches,

t_m is the thickness of the liner, in millimetres,

d is the diameter required for the screw or tube shaft under the liner, in inches or millimetres.

(*b*) The thickness of a continuous liner between the bushes is not to be less than $\frac{3}{4}t$ or $\frac{3}{4}t_m$.

(*c*) Continuous liners should be cast in one piece, or, if made of two or more lengths, the junctions of the separate pieces are to be made by fusion through the whole thickness of the liner.

(*d*) Liners are to be carefully shrunk on, or forced on to the shafts by hydraulic pressure. Pins are not to be used to secure the liners.

(*e*) If the liner does not fit tightly between the bearings in the stern tube, the space between the shaft and the liner is to be charged or forced with a plastic material insoluble in water and non-corrosive.

(*f*) Effective means are to be provided for preventing water from having access to the shaft at the part between the after end of the liner and the propeller boss.

11. **Stern Bush.**—The length of the bearing in the stern bush next to and supporting the propeller, is not to be less than 4 times the diameter required for the screw shaft under the liner.

12. **Couplings.**—(*a*) The diameter of the coupling bolts at the joining faces of the couplings is not to be less than that given by the following formula:—

$$\left.\begin{array}{l}\text{Diameter of coupling bolts,}\\ \text{in inches or millimetres...}\end{array}\right\} = \sqrt{\frac{d^3}{3{\cdot}5 \times n \times r}}$$

where d is the diameter required for the intermediate shafts, in inches or millimetres,

n is the number of bolts in the coupling,

r is the radius of the pitch circle of the bolts, in inches or millimetres.

(*b*) The thickness of the coupling flanges at the pitch circle of the bolt holes is not to be less than the diameter of the coupling bolts, at the face of the coupling. The thickness of the screw shaft coupling flange is not to be less than ·25 of the diameter required for the intermediate shaft.

(*c*) The radius of the curvature at the fillet where the flange starts from the shaft, should not be less than ·125 times the diameter of the shaft adjacent to the flange.

(*d*) Where couplings are separate from the shafts, provision is to be made to resist the astern pull.

GENERAL REQUIREMENTS FOR SINGLE AND DOUBLE ACTING ENGINES.

Section 5. 1. Where the cylinder liners are made of hard close grained cast iron of plain cylindrical form, accurately turned on the outside as well as bored on the inside so that their soundness can be ascertained by inspection, and their thickness at the upper part is not less than $\frac{1}{15}$th of the diameter of the cylinder, they need not be hydraulically tested by internal pressure. If, however, they are made of complicated form, the question of testing is to be submitted.

2. The water jackets of the cylinders, and the water passages of the cylinder covers and pistons, are to be tested by hydraulic pressure to 30 lbs. per square inch, and are to be perfectly tight at that pressure.

3. The exhaust pipes and silencer are to be efficiently water cooled or lagged to prevent damage by heat, and if the exhaust is led overboard near the water-line, means are to be provided to prevent water from being syphoned back to the engine.

4. The cylinders are to be fitted with safety valves loaded to not more than 40 per cent. above the designed maximum pressure in the cylinders and discharging where no damage can occur.

5. The air compressors and their coolers are to be so made as to be easy of access for overhaul and adjustment.

6. Where the fuel is injected into the cylinders by air pressure, one main air compressor should be provided for each main engine.

In single screw vessels, an auxiliary air compressor is to be provided of sufficient capacity to enable the engines to be kept at work at not less than two-thirds of the normal sea power.

In twin screw vessels where two sets of compressors are fitted, the auxiliary compressor is to be of sufficient capacity to enable one main engine to be kept at work at not less than two-thirds of its normal sea power. If in such engines each main compressor is sufficiently large to supply both engines, a smaller auxiliary compressor will be sufficient.

7. A small auxiliary compressor, which does not require compressed air for starting up, is to be fitted for first charging the air receivers.

8. At least one high pressure air receiver is to be arranged with connections to enable it to be used for fuel injection, in case the working receiver of either main engine is out of use from any cause.

9. Where only one scavenging blower is fitted, alternative or duplicate means for driving the blower are to be provided ready for use.

10. The water circulating pump sea suction is to be provided with an efficient strainer which can be cleared inside the vessel.

11. In all vessels fitted with engines in which the lubricating oil is circulated under pressure a spare oil pump is to be supplied with all connections ready for immediate use, and two independent means are to be arranged for circulating water through the oil cooler, where this is fitted.

AIR RECEIVERS AND PIPES.

Section 6. 1. Compressed air receivers for starting air are to be supplied of sufficient capacity to permit of twelve consecutive startings of each main engine without replenishment.

2. Cylindrical receivers for containing air under high pressure, used either for starting or for the injection of fuel in oil engines, may be made either of seamless steel or of welded, or riveted, steel plates.

3. **Quality of Material.**—If made of welded, or riveted, steel plates, the ordinary rules regarding steel material for boilers apply, which provide that where welding is employed, either in the longitudinal seams or at the ends, the material is to have a tensile strength not exceeding 30 tons per square inch. (**Section 6, clause 2, paragraph** (*a*) **Rules for Quality and Testing of Materials**). In these cases the welding is to be lap welding ; neither oxy-acetylene nor electric welding will be permitted.

4. In the case of seamless receivers, the rules for material will be the same as for boiler shells, but the permissible extension may be 2 per cent less than that required with boiler plates.

5. **Tensile and Bend Tests** are to be made from the material of **each** receiver. Where they are welded or riveted, the tests may be made, and the thicknesses verified, before the plates are bent into cylindrical form. In the cases of seamless receivers, the thicknesses are to be verified by the Surveyor before the ends are closed in, and at this time the Surveyor is to select and mark the test pieces required from either of the open ends of the tube. The test pieces are to be annealed before test, so as to properly represent the finished material.

6. The permissible working pressure for welded or seamless receivers is to be determined by the following formulæ :—

$$WP = \frac{C \times S \times (t - 4)}{D}$$

for thicknesses of $\frac{5}{8}$ inch and above.

$$WP = \frac{C \times S \times (t - 2)}{D}$$

for thicknesses below $\frac{5}{8}$ inch.

where **WP** is the working pressure in lbs. per square inch,

S is the minimum tensile strength of the steel shell plates in tons per square inch,

t is the thickness of the shell plates in 32nds of an inch,

D is the internal diameter in inches,

C=38·5 for seamless receivers of thickness $\frac{5}{8}$ inch and above,

C=34·5 for seamless receivers of thickness below $\frac{5}{8}$ inch,

C=27 for welded receivers of thickness $\frac{5}{8}$ inch and above,

C=24 for welded receivers of thickness below $\frac{5}{8}$ inch.

7. For flat end plates welded to cylindrical shells

$$WP = \frac{72{\cdot}5 \times t^2}{D^2}$$

where **WP** is the working pressure in lbs. per square inch,
t is the thickness in 32nds of an inch,
D is the internal diameter in inches.

8. (*a*) The permissible working pressure for receivers made of riveted steel plates is to be determined by the rules regulating the working pressure of boilers ; where end plates are dished outwards to partial spherical form and not fitted with stays the following formula is to be used :—

$$WP = \frac{18 \times S \times t}{R}$$

where **WP** is the working pressure in lbs. per square inch,
t is the thickness in 32nds of an inch,
R is the inner radius of curvature of the end, in inches, which is not to exceed the diameter of the shell,
S is the minimum tensile strength of plates, in tons per square inch.

The inside radius of curvature at the flange connecting the end to the cylindrical shell is not to be less than four times the thickness of the end plate and in no case less than 2·5 inches.

(*b*) Where the end has a manhole in it, $\frac{4}{32}$ inch is to be added to the thickness of the plate.

If the plate at the manhole is stiffened by flanging, the total depth of the flange from the outer surface, in inches, is to be at least

$$= \sqrt{t \times w}$$

where t is the thickness of plate, in inches,
w is the minor axis of the hole, in inches.

9. Each welded or seamless receiver is to be carefully annealed after manufacture, and before the hydraulic test.

10. Each welded or seamless receiver is to be subjected to a hydraulic test of twice the working pressure, which it shall withstand without permanent set.

11. Each receiver made of riveted steel plates for pressures up to 300 lbs. per sq. inch is to be tested by hydraulic pressure to $1\frac{1}{2}$ times the working pressure, plus 50 lbs. per sq. inch. Where higher working pressures are used, the test pressure need not be more than 200 lbs. per sq. inch above the working pressure.

12. All receivers above six inches internal diameter are to be so made that the internal surfaces may be examined, and, wherever practicable, the openings for this purpose are to be sufficiently large for access. Means are to be provided for cleaning the inner surfaces by steam, or otherwise.

13. Each receiver which can be isolated is to be provided with a safety valve, adjusted to the maximum working pressure. If, however, the air compressor is fitted with a safety valve so arranged and adjusted that no greater pressure than that permitted can be admitted to the receivers, they need not be fitted with safety valves.

14. Each receiver is to be fitted with a drain arrangement at its lowest part, permitting oil and condensed water to be blown out.

15. Oil or air pipes subjected to high pressure are to comply with the Rules for steam pipes, **Section 13, clauses 7** and **16 (Rules for Engines and Boilers of Steam Vessels)**; but where solid drawn steel pipes are used the working pressure may be determined from the following formula :—

$$WP = \frac{(t - 4)}{D} \times 114$$

where **WP** is the working pressure in lbs. per square inch to which the pipes will be subjected,
D is the internal diameter of the pipes, in inches,
t is the thickness of the pipes, in 100ths of an inch.

Pipes which are subjected to a working pressure up to 1,000 lbs. per square inch are to be tested hydraulically to at least twice the working pressure to which they will be subjected, and those subjected to a higher working pressure than 1,000 lbs. per square inch to an hydraulic test of at least 1,000 lbs. per square inch above their working pressure.

PUMPING ARRANGEMENTS.

Section 7. 1. The pumping arrangements are to be the same as would be required for steam vessels of similar size and power, with the exception that a bilge suction need not be fitted to the main engine water circulating pump. In the cases of vessels fitted with water ballast, the water ballast pump is to be fitted with a direct suction from the engine room bilges.

2. Where the cooling water discharge from various parts of the engines is led to the bilges, special arrangements are to be made to deal with this water, in addition to the ordinary bilge pumping arrangements.

MISCELLANEOUS.

Section 8. 1. All oil fuel pipes, tanks and their fittings are to comply with the requirements of **Section 20 (Rules for Steel Vessels)**.

2. Special attention is to be given to the ventilation of the engine room.

3. If the auxiliaries are worked by electricity, the cables in connection with them are to be in accordance with the **Rules for Electric Fittings.**

4. It is recommended that all pipes conveying fuel oil should, as far as possible, be made of steel or iron, rather than copper, owing to the rapid corrosion of copper pipes when using oil containing sulphur.

SPARE GEAR.

Section 9. In vessels engaged on open sea service, the articles mentioned in the following list (so far as they are applicable) will be required to be carried, viz. :—

For Main Engines.

1 cylinder cover of each design used, complete with all valves, valve casings, springs and other fittings and, in addition, one complete set of valves for one cylinder, with their springs and other fittings.

Fuel needle valves for half the number of cylinders of each engine.

1 piston complete, with all piston rings, studs and nuts and, in addition, one set of piston rings for one piston.

Telescopic cooling pipes for one piston.

1 set of skew wheels for the cam shaft drive of one engine.

1 set of studs and nuts for one cylinder cover of each design used.

2 crosshead bearing bolts and nuts, or one gudgeon pin where trunk pistons are used.

2 crank pin bearing bolts and nuts.

2 main bearing bolts and nuts.

1 set of bolts for one crank shaft coupling.

1 set of bolts for one intermediate shaft coupling.

For Main Engine Air Compressors and Pumps.

1 set of piston rings for one piston of each size used in the air compressor.

1 half set of suction and delivery valves for each size used in the air compressor.

Not less than 10 per cent. of suction and delivery valves for the scavenge air pump where lift valves are used.

1 impeller, impeller shaft and bearings where scavenge blowers are used. Where more than one scavenge blower is fitted, and one of these is additional to the required capacity of blower or blowers, under full working conditions, no spare parts need be supplied provided the additional blower is arranged to be easily substituted for the working blowers.

1 additional fuel pump or all working parts for one fuel pump.

1 additional water circulating pump to be fitted and connected ready for use.

For each size of Auxiliary Heavy Oil Engine.

1 complete set of valves for one cylinder, with their springs and other fittings.

Fuel needle valves for half the number of cylinders.

1 set of piston rings for one piston.

1 set of studs and nuts for one cylinder cover.

2 crosshead bearing bolts and nuts, or one gudgeon pin where trunk pistons are used.

2 crank pin bearing bolts and nuts.

2 main bearing bolts and nuts.

1 set of piston rings for one piston of each size used in the air compressor.

1 half set of suction and delivery valves for each size used in the air compressor.

1 additional fuel pump or all working parts for one fuel pump.

For Auxiliary Pumps.

1 suction and one delivery valve for the daily fuel supply pump.

1 suction and one delivery valve for the bilge pumps.

General.

A quantity of assorted nuts and bolts.

A length of pipe of each size used for the fuel delivery and injection air pipes to the main and auxiliary power cylinders, and the air delivery from the main and auxiliary compressors to the receivers, with unions and flanges suitable for each.

PERIODICAL SURVEYS.

Section 10. The periodical surveys of the machinery are detailed on pages 21 and 22 under "**Petrol, Paraffin, and Heavy Oil Engines.**"

By order of the Committee,
ANDREW SCOTT,
Secretary.

71, Fenchurch Street, London, E.C.3.
24th April, 1930.

RULES FOR ELECTRIC FITTINGS.

(For Tables, see pages 147-154).

GENERAL.

Section 1. 1. In cases in which electricity is used on board classed vessels for purposes other than propulsion of the ship, the following Rules are to be observed.

2. **Standard Systems.**—The following systems of distribution may be used :—

A. Parallel systems with constant pressure.

(*a*) Single wire with Hull return.
(*b*) Two-wire with direct or single-phase alternating current.
(*c*) Three-wire with direct current.
(*d*) Three-phase three-wire.
(*e*) Three-phase four-wire.

B. Series systems with constant current (direct current only).

3. **Limiting Pressures.**—The pressure of supply is not to exceed the following values :—

A. With direct-current constant-pressure systems :—

(*a*) For power, 500 volts.
(*b*) For lighting and heating, 250 volts.

B. With alternating-current constant-pressure systems :

(*a*) For power and heating, 250 volts.
(*b*) For lighting, 150 volts.

C. With constant-current series systems (direct current only) :—650 volts.

For ships carrying oil having a flash point less than 150° F. (65·5° C.)—*See* **Section 13.**

GENERATING PLANT.

Section 2. 1. **Rating of Generators.**—Generators are to conform to British Standard Specification No. 168, except that in tropical climates, or where fixed in specially hot situations on the ship, the rated full load is not to be exceeded and the temperature rise at rated full load is not to exceed 63° F. (35° C.), all temperatures being measured by thermometer.

2. **Automatic Regulation of Pressure.**—(*a*) Generators are to be compound wound unless arranged to run in parallel and at such distances apart as to render the amount of copper in the equalizing conductors excessive, in which case hey may be shunt wound. The series field windings of every compound generator are to be connected to the positive pole of the machine.

(*b*) Generators, unless otherwise specified, are to be over-compounded 5 per cent under conditions of constant speed and excitation.

3. **Field Regulators.**—Where generators are run in parallel each is to be fitted with an adjustable regulating resistance in series with its shunt field, to vary the pressure of the generator between 5 per cent above, and 10 per cent below the normal at any load, and there are not to be less than 25 equal steps of resistance.

4. **Brush Gear.**—(*a*) The brushes are to be of carbon and are to be provided with flexible copper connections.

(*b*) Means are to be provided for the adjustment of the brushes longitudinally so that they may be staggered to prevent the formation of ridges, in such a manner that in multipolar machines every part of the commutator working surface will be swept by an equal number of positive and negative brushes.

5. **Terminals.**—(*a*) Suitable terminals, clearly marked, are to be provided in an accessible position convenient for wiring, and they are to be furnished with appropriate cable sweating sockets.

(*b*) The terminals are to be so spaced or shielded that they cannot be accidentally earthed, short-circuited, or touched.

6. **Lubrication.**—(*a*) Generators are to be efficiently and continuously lubricated automatically with the base of he machine inclined at any angle up to 15 degrees from the horizontal in any and every direction.

7. **Position in Ship.**—(*a*) The generators are to be placed in a well-ventilated compartment in which inflammable gases cannot accumulate, and in such a position as to be clear of all inflammable material. Unprotected woodwork

or other combustible material is not to be fitted within a distance of 12 inches measured horizontally from, or within 4 feet measured vertically above, the generators.

(*b*) The generators are to be placed in positions in which they are not exposed to risk of mechanical injury or to damage from water, steam or oil, and in all sea-going ships they are to be placed with their axes of rotation in a fore and aft direction.

8. **Plant to be Earthed.**—The bedplate and frame of the generating plant are to be efficiently earthed, and insulation is not to be interposed between the prime mover and the generator.

SWITCHBOARDS.

Section 3. 1. **Position.**—(*a*) Switchboards are to be placed in accessible positions, free from inflammable gases and acid fumes, in which they are not exposed to risk of mechanical injury or to damage from water, steam or oil.

(*b*) Unprotected woodwork or other combustible materia is not to be fitted within a distance of 12 inches of any live metal measured horizontally from, or within 4 feet measured vertically above, the switchboard.

2. **General Construction.**—(*a*) Switchboards are to be constructed wholly of durable, non-ignitable, non-absorbent materials.

(*b*) If insulating material be used for the base, it is to be of permanently high dielectric strength and insulating resistance, and should be submitted for consideration.

(*c*) If semi-insulating materials such as marble or slate are used, all conducting parts are to be insulated from the slate or marble slab with mica or other non-hygroscopic insulating material, and the slab is to be similarly insulated as a whole from the frame on which it is mounted; the frame is to be effectually earthed.

(*d*) The various live parts are to be so arranged, by suitable spacing or shielding with non-ignitable insulating materials, that an arc cannot be maintained between any such parts.

(*e*) All parts, including connections, are to be readily accessible from the front or back. Fuses are not to be placed at the back of the board.

(*f*) Omnibus bars and ordinary connecting conductors on switchboards are to be so proportioned that their average temperature will not rise more than 54° F. (30° C.) above that of the surrounding air when the maximum current flows through them continuously, and the temperature rise of each part is not to exceed the average temperature by more than 9° F. (5° C.).

(*g*) Every equalizer switch and its connections (including the cable from the generator) is to have a current carrying capacity of not less than 50 per cent of the main current of the generator.

(*h*) Each voltmeter, pilot or earth lamp, with its connecting wires, is to be protected individually by a fuse on each insulated pole.

(*i*) Switches are to be so connected to omnibus bars that their blades or moving parts are not alive in the "off" position.

(*j*) Where switches and fuses are fitted on the same pole, they are to be so arranged that the fuses are not alive when the corresponding switches are in the "off" position.

(*k*) Where single-pole switches or fuse-switches are required by these regulations, they are to be fitted on the same pole throughout the installation.

(*l*) Where a separate fuse and switch or separate fuses and linked switches are required by these regulations, they may be replaced by a fuse-switch or linked fuse-switches, as the case may be.

3. **Main Switchgear.**—Each main switch-board is to be fitted with the following switchgear as a minimum.

A. Two-wire Systems.

Where only one generator is installed :

(*a*) For the Generator :—

(i) Either a single-pole overload circuit breaker or a single-pole fuse and a single-pole switch on the insulated pole in a single-conductor or a two-conductor earthed system.

(ii) Either a double-pole overload circuit breaker or a fuse on each pole and a double-pole linked switch in a two-conductor insulated system.

(*b*) For each Outgoing Circuit :—

(i) A single-pole fuse and a single-pole switch on the insulated pole in a single-conductor or a two-conductor earthed system.

(ii) A fuse on each pole and a single-pole switch on one pole in a two-conductor insulated system. All these switches are to be on the same pole.

Where more than one generator is installed, the generators not being arranged to run in parallel :

(*c*) For each Generator :—

(i) Either a single-pole overload circuit breaker, or a single-pole fuse and a single-pole switch, on the insulated pole in a single-conductor or a two-conductor earthed system.

(ii) Either a double-pole overload circuit breaker, or a fuse on each pole and a double-pole linked switch in a two-conductor insulated system.

(*d*) For each Outgoing Circuit :—

(i) A single-pole fuse and a single-pole change-over switch on the insulated pole in a single-conductor or a two-conductor earthed system.

(ii) A fuse on each pole and a single-pole change-over switch on one pole, all such change-over switches being on the same pole, in a two-conductor insulated system.

Where more than one generator is installed, the generators being arranged to run in parallel :

(*e*) For each generator, if shunt-wound :—

A circuit breaker with overload and reversed current trips. This circuit breaker to be :—

(i) Single-pole in a single-conductor or a two-conductor earthed system.

(ii) Double-pole in a two-conductor insulated system.

(*f*) For each generator, if compound wound :—

A circuit breaker with overload and reversed-current trips, and a single-pole equalizer switch so interlocked with the circuit breaker that this equalizer switch must be closed before the circuit breaker, and cannot be opened until the main circuit is broken. This circuit breaker to be :—

(i) Single-pole in a single-conductor or a two-conductor earthed system.

(ii) Double-pole in a two-conductor insulated system.

(*g*) For each Outgoing Circuit :—

(i) A single-pole fuse and switch on the insulated pole in a single-conductor or a two-conductor earthed system.

(ii) A fuse on each pole and a single-pole switch on one pole in a two-conductor insulated system. All these switches are to be on the same pole.

B. Three-wire Systems.

Where more than one generator is installed, the generators being arranged to run in parallel, whether the machines are wound for the full pressure or for half pressure and act as balancers :—

(*a*) For each generator, if shunt-wound :—

A double-pole circuit breaker with overload and reversed current trips.

(*b*) For each generator, if compound-wound :—

A double-pole circuit breaker with overload and reversed-current trips, and a single-pole equalizer switch so interlocked with the circuit breaker that this equalizer switch must be closed before the circuit breaker, and cannot be opened until the main circuit is broken.

(*c*) For each outgoing three-wire circuit where the supply is given to three conductors :—

Either a double-pole overload circuit-breaker controlling the outer conductors, or a fuse on each outer conductor and a double-pole linked switch controlling the outer conductors. A fuse or switch is not to be included in the neutral conductor, but this requirement does not preclude the provision of an isolating link for testing purposes.

(*d*) For each outgoing two-conductor insulated circuit where the supply is given from the neutral and one outer of a three-wire system :—

Either a double-pole overload circuit-breaker, or a double-pole linked switch with a fuse on each pole.

(*e*) For each outgoing single-conductor or two-conductor earthed circuit where the supply is given from the neutral and an outer of a three-wire system :—

Either a double-pole circuit breaker with overload trip on that pole which is connected to the outer conductor, or a single-pole fuse on that pole which is connected to the outer conductor and a double-pole linked switch.

C. Three-phase Three-wire Systems.

(*a*) For each generator :—

A triple-pole circuit-breaker with overload trips on at least two phases.

(*b*) For each outgoing three-conductor circuit to which a supply is given from the three conductors :—

Either a triple-pole circuit breaker with overload trips on at least two phases, or a triple-pole linked switch with a fuse on each pole.

(*c*) For each outgoing two-wire circuit to which a supply is given from any two of the three conductors :—

Either a double-pole overload circuit breaker, or a double-pole linked switch with a fuse on each pole.

D. Three-phase Four-wire Systems.

(*a*) For each generator :—

A triple-pole circuit breaker with an overload trip on each phase.

(*b*) For each outgoing three-conductor circuit to which a supply is given from the three conductors :—

Either a triple-pole circuit breaker with overload trips on at least two phases, or a triple-pole linked switch with a fuse on each pole.

(*c*) For each outgoing two-wire circuit to which a supply is given from one of the three conductors and the neutral :—

Either a single-pole overload circuit-breaker, or a single-pole switch and single-pole fuse, placed on that side of the circuit which is connected to one of the three phases.

(*d*) For each outgoing four-wire circuit used to supply a distribution switchboard from which three-wire or two-wire circuits radiate :—

Either a triple-pole circuit breaker with an overload trip on each phase, or a triple-pole linked switch with a fuse on each pole. A fuse or switch is not to be included in the neutral conductor, but this requirement does not preclude the provision of an isolating link for testing purposes.

4. Instruments.—Each main switchboard is to be provided with the following instruments as a minimum :—

A. Two-wire Systems.

(*a*) Where only one generator is installed, one ammeter and one voltmeter, except in the case of tugs and similar vessels.

(*b*) Where more than one generator is installed, the generators not being arranged to run in parallel, an ammeter for each generator and one voltmeter, for use on any generator, fitted with a linked double-pole multiple-way switch or plug.

(*c*) Where more than one generator is installed, the generators being arranged to run in parallel, an ammeter for each generator, and two voltmeters; also a synchronizing device for paralleling purposes if the current be alternating. For compound machines the ammeter is to be connected on the opposite pole from that to which the equalizer connection is made. One of these voltmeters is to be fitted with a linked double-pole multiple-way switch or plug enabling it to be connected to any one generator before the machine is put in circuit; the other voltmeter is to be permanently connected to the omnibus bars.

B. Three-wire Systems.

In addition to the instruments required for two-wire systems a voltmeter is to be connected between the neutral and each outer omnibus bar; also a central zero ammeter in the main neutral conductor.

C. Three-phase Systems.

(*a*) Where only one generator is installed, an ammeter on each phase, and one voltmeter, except in the case of tugs and similar vessels.

(*b*) Where more than one generator is installed, the generators being arranged to run in parallel, an ammeter on each phase for each generator, two voltmeters and a synchronizing device for paralleling purposes. One of these voltmeters is to be fitted with a linked double-pole multiple-way switch or plug enabling it to be connected to one phase of any one generator before the machine is put in circuit. The other voltmeter is to be permanently connected to one phase of the omnibus bars. All these voltmeter connections are to be made to the same phase in each case.

D. Earth Testing.

Main switchboards, except in the case of tugs and similar vessels where only one generator is installed, are to be provided with suitable means for indicating the state of the insulation of the system, either by lamps, voltmeters, or otherwise.

5. Switches and Circuit Breakers.—Each switch, fuse-switch, and other circuit breaker is to comply with the following requirements :—

(*a*) All parts are to be so proportioned that when the normal current for which they are designed flows through them continuously, their temperature will not rise above that of the surrounding air more than 36° F. (20° C.) in the case of switches rated below 100 ampéres, and 54° F. (30° C.) in the case of switches rated at 100 ampéres or above.

(*b*) Each fuse-switch when opening the circuit as a switch, and each switch, shall break the circuit without permitting an arc to be maintained when a current 50 per cent greater than that for which it is rated is flowing under a pressure 50 per cent in excess of the pressure of supply. Each fuse-switch when opening the circuit as a fuse, and each circuit breaker, is to comply with the Rule for fusible cut-outs.

(*c*) Each circuit-opening device is to be so constructed and arranged that when placed in the "off" position it cannot accidentally move sufficiently to close the circuit.

(*d*) If the current to be interrupted be sufficiently large to cause damage to the main contacts, suitable arrangements are to be made for the easy renewal of the parts on which the arc is formed.

(*e*) The handles and their attachments are to be mechanically strong, and the exposed surface is to consist entirely of insulating material, or of metal. They are to be so designed and arranged that the hand of the operator cannot accidently touch live metal or be injured through an arc arising from the switch or an adjacent fuse blowing. They are not to operate through open slotted holes.

(*f*) The bases are to be of durable, non-ignitable, insulating, non-absorbent material, and are to comply with the following conditions, viz. :—

(i) Semi-hygroscopic materials such as slate or marble, if used, are to be free from metallic veins, cracks or other defects.

(ii) The slabs are to be planed all over and, if of slate, treated, after drying, with a damp-proof medium, all holes being similarly treated.

(iii) Bolts for securing marble or slate slabs to a metallic framework or case are to be insulated from the slabs, and the latter from the framework or case, by non-hygroscopic insulating bushes and washers.

(*g*) Where switches are not fixed on a switchboard, the live parts are to be enclosed by covers of non-ignitable material. In positions in which the switches are liable to mechanical injury the covers are to be of rigid metal or protected by a suitable guard. In other positions the covers may be either of rigid metal or non-conducting material. Metal cases are to be well clear of live parts, and where the switches are rated for currents exceeding 6 amperes at pressures exceeding 125 volts they are to be lined with non-ignitable insulating material.

(*h*) All switches fixed in positions exposed to the weather, to drip, or to an excessively moist atmosphere, are to be contained in watertight cases, which are to be provided with cable glands or bushings, or be adapted to receive screwed conduit, according to the way in which the cables entering the fittings are run.

(*i*) Each electro-magnetic circuit breaker is to be provided with suitable means of adjustment for determining the current at which it opens, and is to be so arranged that it cannot be held in against this current.

(*j*) Circuit breakers are to be so arranged and placed that no inflammable material is endangered by their coming into action.

6. **Fusible Cut-outs.** — Each cut-out is to comply with the following requirements :—

(*a*) All parts other than the fusible metal are to be so proportioned that their temperature will not rise more than 54° F. (30° C.) above that of the surrounding air when the normal working current for which they are designed flows through them continuously.

(*b*) The fuse is to be of such a size that it would be melted in one minute or less (two minutes or less in the case of a lead-tin alloy fuse) by a current equal to twice the rating of the smallest cable protected by it (as given in **Tables IX.** and **X.**) provided that no fuse smaller than one rated to blow at 7 amperes need be inserted in any final sub-circuit, and that for the purposes of this regulation, the current carrying capacity of a flexible cord or cable is considered to be equal to that of a rubber insulated cable of equal cross section.

Tables IX. and **X.** give the approximate fusing currents for wires of copper and lead-tin alloy respectively.

(*c*) Each cut-out is to be provided with a suitable non-ignitable and insulating carrier for the fuse, of such form as to protect a person handling it from shock and burns.

(*d*) Contacts are to be provided on the carrier to which the ends of the fuse can be readily attached.

(*e*) The bases of cut-outs are to be of durable, non-ignitable, non-absorbent, insulating material and are to be provided with fixed circuit contacts of such form as to retain the carrier in position in the presence of vibration.

(*f*) The circuit contacts and their terminals are to be so spaced or shielded that an arc cannot be maintained when a fuse is blown.

(*g*) Fuses are not to be placed in switches, wall plugs, sockets, or in ceiling roses.

(*h*) Where cut-outs are not fixed on a switchboard they are to be grouped on section or distribution boards, or they are to be contained within cases conforming in all respects to the requirements of **clause 7** of this Section.

7. **Joint Boxes, Section and Distribution Boards.** —(*a*) Joint Boxes, Section and Distribution Boards are to be in accordance with **clauses 1 and 2 of this Section,** as regards position and general construction. The fuses fitted in section and distribution boards are to conform with **clause 6 of this Section.**

(*b*) Each section or distribution board is to be contained within a protecting case, unless of such size that they are contained in separate compartments or spaces in the ship.

(*c*) The cases are to be of metal, except in passenger and other accommodation and in crew spaces, where they may be of wood.

(*d*) All metal cases are to be lined with non-ignitable insulating shields opposite switches and cut-outs, whether such cut-outs are of the enclosed or open type, and all live parts therein are not to be less than $1\frac{1}{2}$ inches clear of the case.

(*e*) All soft-wood cases are to be lined with non-ignitable insulating material, which is to clear all live parts by not less than one inch. Cases of hard-wood, such as teak, need not be so lined.

(*f*) Boxes not provided with backs forming an integral portion thereof are to be fitted with a non-ignitable insulating shield between their contents and the bulkhead, or any other structure, to which they are fixed.

(*g*) Where glass fronts are provided they are to clear all live parts by not less than one inch. Where the boxes are of metal, glass fronts may be regarded as insulating shields.

(*h*) All cases fixed in positions exposed to the weather, to drip, or to an excessively moist atmosphere, are to be watertight, and are to be provided with cable glands or bushings, or be adapted to receive screwed conduit, according to the way in which the cables entering these fittings are run.

CONDUCTORS.

Section 4. 1. **Material.**—(*a*) All conductors are to be of annealed copper conforming to British Standard Specification No. 7.

(*b*) Where the insulating covering of the conductor contains sulphur, each wire is to be efficiently and uniformly coated with tin free from all impurities.

2. **Minimum Size of Conductor.**—A cable having a conductor of less sectional area than 0·0015 square inch is not to be used except for wiring ornamental fittings which cannot admit this cable; the sectional area of the conductor of the cable for such fittings is not to be less than 0·0006 square inch.

3. **Maximum Size of Single Wire.**—All conductors having an effective sectional area exceeding 0·0033 square inch are to be stranded.

4. **Proportioning of Conductors to Current Carried.**—The size of conductors is to be so selected that the fall of pressure between the main switchboard omnibus bars and any, and every, point of the installation when carrying the maximum load probable under the heaviest conditions of service will not exceed 2 volts plus 3 per cent of the omnibus bar pressure for lighting and 2 volts plus 5 per cent of the omnibus bar pressure for power and heating circuits, provided that in each case the current will not exceed that given in **Table I.** for each size of conductor when this maximum current is being carried and that **clause 2** of this Section be complied with.

5. **Conductors Intermittently Loaded.**—**Table III.** gives the maximum permissible currents for half-hour and one-hour ratings, and the sizes of cables which may be used for such ratings in place of the cables specified in **Table I.** for continuous loading. In no case is a shorter rating than one half-hour to be taken whatever may be the degree of intermittency.

6. **Standard Sizes.**—The sizes of conductor shown in **Tables I.** and **II.** are recognised as standard for ships installations. These Tables show the maximum current that each size may carry when the length of conductor is such that the fall of pressure does not exceed that corresponding to the percentage limits laid down in **clause 4** of this Section. The Tables also show the total length of conductor in circuit that will give a drop of pressure of 1 volt when such maximum current is being carried. In **Table I.** allowance is made for the class of insulation with which the conductor is covered.

INSULATION AND PROTECTIVE COVERING OF CABLES.

Section 5. 1. **Types of Cables.**—Only the following types of cables are to be employed, either single, twin, concentric or multicore:—

(*a*) Vulcanized rubber insulated.
- (i) Braided.
- (ii) Tough rubber sheathed (with or without braiding over the sheathing). For thickness of tough rubber sheathing, *see* **Table XIII.**
- (iii) Lead covered (with or without braiding over the lead).
- (iv) Lead covered and armoured (with or without braiding over the armour).
- (v) Braided and armoured (with or without braiding over the armour).

(*b*) Paper insulated (with or without braiding over the lead).
- (i) Lead covered.
- (ii) Lead covered and armoured (with or without braiding over the armour).

NOTE :—The use of cables insulated with varnished cambric is permitted provided the cables comply with the following requirements, viz. :—

(i) The dimensions and current carrying capacities to be as specified in **Tables XI.** and **XII.** respectively.

(ii) The cables are to withstand the pressure test and other tests specified in British Standard Specification No. 7, for paper insulated cables for 660 volts.

(iii) The cables are to be lead covered, or lead covered and armoured (with or without braiding over the lead or armour).

(iv) The installing and fixing of the cables to be in accordance with the regulations for paper insulated cables. (*See* **Section 6**).

Where it is desired to use types of cables insulated otherwise than here specified, a report from a recognised testing authority regarding the behaviour, properties and life of the insulating materials employed, is to be submitted for consideration.

2. **Vulcanized Rubber Insulated Cables.**—(*a*) Vulcanized rubber insulated cables are to be insulated with a layer of pure rubber next to the conductor, an intermediate layer of vulcanizing rubber, and an outer jacket of vulcanizing rubber. These three layers are to constitute the dielectric. Alternatively, vulcanized rubber insulated cables may be insulated with a homogeneous dielectric consisting of vulcanized rubber applied in one or more layers, provided the quality of the tinning is such that there is no corrosion of the tinning in the finished cable. The radial thickness of dielectric is not to be less than that specified in **column 3 of Table IV.** The dielectric is to be surrounded by a layer of waterproof tape, and the whole is to be vulcanized together.

(*b*) Braided cables are to have an exterior braiding of hemp, cotton or jute thoroughly impregnated with a protective compound of such a nature as not to have any deleterious action on the rubber or armouring, as the case may be. The finish of the braiding is to be smooth and uniform.

(*c*) Cable of a higher grade than 600 megohms is not recommended for use in hot situations.

3. **Paper-insulated Cables.**—(*a*) Paper-insulated cables are to be insulated with a covering of paper impregnated with a chemically neutral insulating compound, and are to withstand the pressure test and other tests specified in British Standard Specification No. 7.

(*b*) The radial thickness of dielectric is not to be less than that specified in **column 3 of Table V.**

4. **Lead Covering.**—(*a*) All cables where required to be lead covered are to be provided with a closely fitting sheath either of commercially pure lead or of an approved lead alloy. The sheath is to be of uniform thickness concentric with the conductor, free from flaws of all kinds and having a smooth exterior surface.

(*b*) The radial thickness of lead is not to be less than that specified in **column 8 of Table IV.** or **column 4 of Table V.** according to the dielectric used.

5. **Armouring.**—(*a*) Lead-covered cables where required to be armoured are to have over the lead a layer of jute yarn, hessian tape, or other suitable material, in conformity with **Table VI.**, impregnated with a moisture-resisting preservative compound. On the jute is to be bedded an armouring of annealed and galvanized steel wire ; each wire is to be of the diameter specified in **column 10 of Table IV.** or **column 6 of Table V.** The wires are to have a uniform lay not exceeding 10 times the diameter of their pitch circle for wires of 0·08 inch diameter, and not exceeding 8 times the pitch circle diameter for smaller wires. The armouring is to be so applied as to present a uniform cylindrical exterior surface, and the overall diameter is not to exceed that specified in **column 11 of Table IV.** or **column 7 of Table V.**

(*b*) Braided cables armoured without the interposition of a lead covering are to conform to the above except that the armouring is to be bedded on the braiding.

6. **Tests of Dielectric of Cables.**—(*a*) The dielectric of cables, except flexible cords, insulated with vulcanized rubber or impregnated paper is to withstand the pressure test and other tests specified in British Standard Specification No. 7. Subsequent to such pressure test and whilst the cable is still immersed in water the insulation resistance at a temperature of 60° F. (15·6° C.), after one minute's electrification at a pressure of at least 500 volts, is not to be less than that given in Table VII.

(*b*) The insulation resistance of each insulated conductor of a multicore cable, except flexible cords, is not to be less than that given in Table VII. for single conductors of the same sectional area.

(*c*) The insulation resistance of the dielectric separating the two conductors of a concentric cable is not to be less than that given in Table VII. for single conductors having the same diameter as the inner conductor.

7. **Multicore Cables.**—Multicore cables are to be either insulated with vulcanized india-rubber or impregnated paper. The insulated cores are to be laid up in a symmetrical manner with jute wormings where required to make the cable of circular section, and be either braided, lead-covered with or without armouring as herein described in the case of single cables.

Multicore and concentric cables are to be made in accordance with the requirements of the Rules relating to the quality, dimensions and tests of single-core cables, so far as they are applicable.

Where applicable the dimensions of lead covering and armouring are to be in accordance with British Standard Specification No. 7.

INSTALLING AND FIXING OF CABLES.

Section 6. 1. **Cable Sockets and other Connections.**—(*a*) The ends of all cables having a sectional area of 0·04 square inch and above are to be provided with soldering sockets.

(*b*) Soldering fluids containing acid or other corrosive substances are not to be used.

(*c*) When soldering or securing the ends of cables to sockets or terminals, the dielectric is not to be removed farther than is necessary to allow the unreduced conductor to enter and completely fill the socket or terminal.

(*d*) The braid, lead, or other covering over the dielectric, including the tape in contact therewith, is to be cut back at least half an inch from the end of the dielectric.

(*e*) In the case of paper-insulated cables, the exposed conductor and dielectric is to be protected from moisture by being suitably sealed with insulating compound.

(*f*) The ends of the stranded conductors unprovided with cable sockets are to be made solid by soldering in the case of all conductors insulated with paper, and in the case of those insulated with rubber, where the cables are fixed in damp situations.

2. **Selection of Cable Runs.**—(*a*) Cables are to be fixed as far as possible in accessible positions, so chosen that they are not exposed to drip or accumulation of water or oil, to high temperature from boilers, steam pipes, uptakes or other hot objects, or to avoidable risk of mechanical damage.

(*b*) The runs are to be as direct as possible and an unarmoured rubber-insulated cable is not to be bent to a shorter radius than twice its overall diameter, and an armoured rubber-insulated cable to a shorter radius than three times its overall diameter. No paper-insulated cable (whether armoured or not) is to be bent to a radius shorter than six times its overall diameter.

3. **Support and Protection of Cables.**—(*a*) If not exposed to risk of mechanical damage cables may be secured in one of the following ways:—Cables of all classes may be run in wood casing in dry situations. The casing may form part of ornamental woodwork provided that ready access can be had to the cables contained therein. The casing and capping are to be secured by screws, which for the capping are to be of brass and on the outer edges only. Precautions are to be taken to ensure the separation of cables run in separate grooves where cables cross one another.

(*b*) Armoured cables and lead-covered cables, where not run in wood casing, are to be secured by metal clips having smooth or rounded edges, and effectual means are to be taken to ensure that the electrical resistance between any two points of the metallic envelopes of such cables does not exceed 2 ohms. Such clips are to be firmly secured by screws of ample strength, and are to be spaced in accordance with **Table VIII.** Armoured cables having a sectional area of 0·25 square inch and upwards may be carried by metal hangers instead of being secured by clips. Metal staples are not to be used for any class of cable.

(*c*) If cables are exposed to the risk of mechanical damage they are to be efficiently protected by sheet iron plating or by heavy-gauge screwed conduit. Conduits are to be electrically and mechanically continuous across all joints therein, and the entire length is to be effectually earthed. Ventilating outlets are to be provided preferably at their highest and lowest points to allow circulation of air and to ensure that no water can lodge in any part of the conduit. All open ends of conduit are to be bushed to avoid abrasion of the cable coverings and all openings are to be protected against the direct access of sea water.

(*d*) Cables in machinery spaces or where unavoidably exposed to the weather or to the action of sea water are to be either lead covered with or without further protection, or to be run in conduit as required by paragraph (*c*).

(*e*) Cables entering refrigerating chambers are to pass normally through the insulation of the chamber, and are to be protected by a continuous lead tube flanged over at each end.

(*f*) Cables fixed within refrigerating chambers are not to be embedded in the insulation, but are to be in full view throughout their length, and are to be supported by clips made of porcelain, hard wood, or other non-metallic and

non-hygroscopic material. In all cases the cables are to be sheathed with commercially pure lead or with lead alloy, in accordance with **Section 5, clause 4.** If sheathed with commercially pure lead they are in addition to be braided as laid down in **Section 5, clause 3** (*b*).

(*g*) Cables of opposite polarity may be bunched in conduit if carrying direct current; if carrying alternating current they are to be bunched. Where protected by wood casing, cables of the same polarity may be bunched. Lead-covered and armoured cables may in all cases be bunched, whatever their polarity.

(*h*) Every lead-covered cable, whether armoured or not, and every armoured cable, is to have its lead covering and/or armouring efficiently earthed at both ends, except in the case of such cables forming final sub-circuits, which are to be earthed at the supply end only. Effectual means are to be taken to ensure that all metallic envelopes of cables are made electrically continuous throughout their length. All earthing connections are to be effected by soldered joints or clamps, or alternatively by glands specially designed for the purpose of forming part of joint boxes or similar fittings in which cables terminate, and are to conform to the requirements of **Section 7, clause 4**, as far as they are applicable.

4. **Joints during Erection.**—(*a*) All connections between large rubber-insulated cables are to be made by means of clamped sleeves or tees in joint boxes constructed in accordance with **Section 3, clause 7**, and those between small cables and between small cables and flexibles by means of clamped connections contained within suitable receptacles, which in the case of lamp fittings may form part of such fittings. Joints in flexibles are not permissible.

(*b*) Connections between lead-covered paper-insulated cables may be made by the same means as for rubber-insulated cables, the insulation at their ends being suitably sealed against moisture; or the conductors may be joined by means of copper sleeves, the whole being sweated together. Joints made in this manner are to be lapped with paper or pure cotton tape, impregnated immediately before use, and are to be enclosed in boxes, or, preferably, lead sleeves or tees wiped on to the cable coverings, these receptacles being filled with an insulating compound impervious to moisture. Lead sleeves and tees are to be painted with two coats of tough elastic enamel on completion of the joint.

5. **Watertight Glands and Deck Tubes.**—All cables passing through decks or watertight bulkheads are to be provided with deck tubes or watertight glands.

6. **Cables passing through Beams and Non-Watertight Partitions.**—Unarmoured cables passing through beams and non-watertight partitions are to have the holes through which they pass bushed with lead or other soft non-ferrous material.

MAIN DISTRIBUTION.

Section 7. 1. **Subdivision of Circuits.**—(*a*) Each installation is to have its individual lamps and other devices consuming small currents grouped into circuits taking not more than 6 amperes, and the maximum number of points on each such final sub-circuit is not to exceed ten. These final sub-circuits are to radiate from a sub-distribution board

NOTE:—A point is the termination of the wiring for attachment to a fitting for one or more lamps or other consuming devices.

(*b*) Each sub-distribution board and each lamp or other consuming device taking more than 6 amperes is to be connected to a separate way on a section or main distribution board. Each section or main distribution board in turn is to be connected either to a separate way on the main switchboard or to one way of a distribution board for larger currents, which in turn is to be connected to the main switchboard or to one way of a distribution board for still larger currents. The number of such distribution boards intervening between the final sub-distribution boards and the main switchboard will depend upon the size and disposition of the installation.

(*c*) Where three-wire distribution is employed and the pressure across the outer conductors exceeds 250 volts the pressure between any two points in one space or compartment where portable fittings, appliances or accessories are likely to be used is not to exceed 250 volts unless the fittings, appliances or accessories between which there may be a higher pressure are so situated that they cannot be brought within 6 feet of each other.

2. **Control of Circuits.**—(*a*) Each two-wire circuit on a distribution board whether supplied from a two-wire system, from a three-wire system with insulated neutral, from a three-phase four-wire system with insulated neutral, or from a three-phase three-wire system, is to be controlled by a fuse on each insulated pole, and, except in the case of a sub-distribution board, by a switch on one insulated pole.

(*b*) Fuses or switches are not to be connected to that pole of the circuit which is either earthed or derives its polarity from an earthed conductor.

(*c*) The neutral conductor of a three-wire system or of a three-phase four-wire system whether earthed or not, is never to be interrupted by a fuse or switch, but an isolating link may be fitted for testing purposes in the neutral or any other conductor, provided it be arranged for use by skilled persons only.

(*d*) Each three-wire circuit supplied from all three conductors of a three-phase system is to be controlled by a triple-pole circuit breaker with overload trips on at least two phases, or by a triple-pole linked switch and by a fuse on each pole.

3. **Earthing of Neutral.**—Where the distribution is effected on the three-wire system, whether with direct or alternating current, the neutral may be earthed at one or more points whatever the pressure of supply, but if the pressure exceed 250 volts (as allowed for a direct-current supply only) whether across the outer conductors of a three-wire system or on a plain two-wire system, the neutral is to be solidly and permanently earthed at one point at least; in the latter case a neutral point is to be provided by means of static coils on the generator.

4. **Earthing Connections.**—(*a*) Each conductor used for earthing purposes which does not normally carry current, is to be of copper having the same sectional area as the working conductor, but not less than 0·003 square inch, for all sizes up to 0·007 square inch. Above this size a conductor of not less than 0·007 square inch is to be provided for every 50 amperes of working current or part thereof. Its sectional area need not exceed 0·1 square inch.

(*b*) Each conductor used to carry the working current of a circuit to the ship's structure on the single-wire system of distribution is to be of the same sectional area as the corresponding conductor of the insulated portion.

(*c*) All connections to the ship's structure are to be in accessible positions.

(*d*) Solid wires are to be connected to the ship's structure by being formed into a hook and placed under a brass washer and secured by a screw of not less than $\frac{3}{8}$ inch diameter used for this purpose only.

(*e*) Cables are to be provided with cable sockets secured to the ship's structure by screws of not less than $\frac{3}{8}$ inch diameter.

(*f*) In all cases care is to be taken to ensure bright metallic surfaces at the contact areas immediately before screwing up.

5. **Two-wire Circuits supplied at Pressures exceeding 250 Volts.**—Where a pressure exceeding 250 volts (as is allowed for a direct-current supply only) is employed, the following conditions are to be observed:—

(*a*) Machines, whether generators or motors, are not to be of the open type.

(*b*) Motors only are to be supplied at such higher pressure.

(*c*) Only motors exceeding 3 brake horse-power are to be supplied at such higher pressure.

(*d*) Portable motors, whatever their size, are not to be supplied at such higher pressure.

(*e*) All metal work other than that designed to be alive is to be efficiently connected with earth.

(*f*) The wiring is to be carried out wholly with lead-covered and armoured or braided and armoured cables and the armour (and the lead, if there be lead) is to be electrically continuous and efficiently connected with earth.

(*g*) The motors and all accessory apparatus in connection therewith are to be so constructed, enclosed, and protected that there will be no danger of any shock in the ordinary handling thereof, and that the danger of fire under abnormal conditions will be reduced to a minimum.

(*h*) All switchboards are to have their live parts protected against accidental contact.

6. **Alternative Lighting.**—Alternate groups of lamps in engine and boiler-rooms are to be supplied from circuits so arranged that the fusing of any one cut-out (other than a cut-out on the main switchboard) will not leave these spaces in darkness.

7. **Emergency Supply.**—(*a*) Where the Board of Trade require an emergency supply to be provided it is to be adequate in amount, and so disposed as to meet all requirements concerning safety imposed by the Board of Trade.

(*b*) The emergency circuits are to be connected direct to a change-over switch, or switches, fitted near the source of emergency supply, enabling these circuits to be quickly transferred from the ordinary to the emergency source.

8. **Interference with Magnetic Compasses.**—(*a*) Dynamos, motors, secondary batteries, control gear, resistances and all apparatus producing an external magnetic field when in use are to be fitted at such distances from the compass bowl, as will reduce the magnetic field produced by such apparatus to a negligible value thereat.

(*b*) Single-conductor circuits carrying continuous current are not to be fitted within 30 feet of standard and steering compasses. In order that the lead and return currents may neutralize one another in two-conductor systems, conductors in the vicinity of the compass are preferably to be twin ; if separate, they are to be fixed as close to one another as possible, and be equidistant from the compass throughout their length. Conductors within the compass binnacle are to be as short and direct as possible ; if separate, they are to be twisted together and are not to be coiled into spiral loops.

(*c*) Incandescent electric lamps employed for illumination of the compass card are not to consume more than 0·6 ampere. Such lamps are to be so placed that all live parts are at a distance of not less than 7 inches from any part of the magnetic system of the compass.

(*d*) Careful tests are to be made during the adjustment of the compasses. The effect of switching on and off circuits, motors and other electro-magnetic apparatus within the vicinity of the compasses, is to be noted and careful records are to be kept of any errors observed, whether corrected or not.

9. **Navigation Lamps.**—(*a*) Each navigation lamp is to be separately wired and is to be controlled by a separate switch, and separate fuses which are to be double-pole unless one conductor of the system be earthed ; such switches and fuses are to be grouped in a position accessible only to the officers of the watch.

(*b*) Each navigation lamp is to have an automatic indicator in its circuit placed on or adjacent to its switch and arranged to give an aural or visual signal in case of extinction of the light by breakage of the lamp filament or from other cause.

(*c*) Carbon or metal filament vacuum lamps with bayonet socket caps are to be used. The illuminating power of the lamps is to be 32 candles.

The filament is to be of the cylindrical ("squirrel cage") type. The diameter of the cage forming the filament is not to be less than 1 inch or more than $1\frac{3}{8}$ inch. Double filament lamps are not to be used.

(*d*) The lamp is to be fitted in a vertical position with the cap downwards. Should the lantern be provided with a dioptric lens the luminous centre of the source of light is to coincide with the focal centre of the lens.

NOTE.—This clause does not apply in the case of tugs and similar vessels.

SECONDARY BATTERIES FOR LIGHTING AND POWER.

Section 8. 1. **Construction.**—The cells of secondary batteries are to be of such construction as to prevent spilling of the electrolyte through the motion of the ship and to prevent the emission of acid spray on surrounding objects.

The containers are to be of strong construction and of non-brittle material ; they are not to be of celluloid. The plates are to be of such dimensions and so arranged that they are firmly secured against motion within the containers.

2. **Arrangement.**—Each battery is to be so arranged that a potential difference exceeding 50 volts does not exist between adjacent cells and that each cell will be readily accessible from the top and from at least one side ; if possible they are to be arranged in a single tier. The cells are to be carried by glass or vitreous porcelain insulators provided with suitable channels to contain oil, and insulators of similar material, but not necessarily filled with oil, are to be employed to prevent any movement of the cells arising from motion of the ship.

3. **Position, Protection and Ventilation of Battery Compartment.**—(*a*) The position of the battery compartment is to be such that the magnetic compasses are not affected by currents in the battery or in the connections thereto.

(*b*) Where acid is used as an electrolyte for the cells, the deck below the cells is to be lined with lead or other acid-resisting material so as effectually to prevent any acid getting into contact with the structure of the ship. All metal-work within the compartment, including exposed metal on the battery and its connections, is to be protected with acid-resisting paint. All trunks or other parts exposed to acid fumes or gases are to be similarly protected.

(*c*) The compartment in which batteries are fixed is to be thoroughly well ventilated by means of supply and exhaust ventilators, independent of one another, so arranged that it will be impossible for gases to accumulate in large quantities during charge or discharge of the battery.

4. **Control.**—(*a*) Suitable means are to be provided for controlling the current with which a battery is being worked. As a minimum this is to comprise an automatic cut-in and cut-out switch and fusible cut-out, or alternatively, a circuit breaker with overload and reverse-current trips.

(*b*) Switches, fuses, and other electrical fittings, liable to cause an arc are not to be placed within the battery room, but a fuse is to be placed in each conductor immediately outside the battery room, such conductors being spaced at least 3 inches apart on insulators in the battery room, and the holes in bulkheads or decks through which they pass being substantially and tightly bushed, a separate bush being provided for each cable.

(*c*) All connections within an acid battery room are to be either of bare metal or lead-covered cables.

FITTINGS.

Section 9. 1. **General Requirements.**—(*a*) Fittings are to be weatherproof on weather decks, in stokeholds and engine rooms, and wherever exposed to drip or condensed moisture. In spaces in which goods are liable to be stacked in close proximity to them, they are to be provided with substantial metal guards.

(*b*) Open type fittings whether fixed or portable are not to be used in spaces where

(i) Inflammable or explosive dust or gases are liable to be present or where inflammable goods are stored. In such situations lamp fittings are to be of strong construction, having air-tight external globes of thick glass, provided with substantial guards.

(ii) In positions in which the lamp is either near to, or can swing near to, readily combustible materials.

(*c*) Open type fittings are not to be furnished with combustible shades unless such shades are kept free from contact with the lamps by suitable guards or supports. Celluloid is not to be used in any situation near a lamp.

(*d*) Switches and other fittings liable to arc when operated are not to be installed in bunkers or other spaces in which inflammable or explosive dust or gases are liable to be present, whether controlling lights in such spaces or not.

(*e*) Lamp fittings installed in spaces allotted alternatively to passengers or cargo are to be of extra strong construction so designed as to admit of easy removal of lamps, globes and guards, provision being made for the protection of the base of the fitting and its lampholder after such removal by a screwed metal cover. Alternatively, the complete fitting may be protected by a strongly constructed hinged or screwed metal cover completely enclosing it. In either case the enclosure is to be such that the fitting cannot be tampered with easily. Switches and fuses controlling lights in spaces of this kind are, wherever possible, to be placed outside the spaces. Where this is impracticable they are to be contained in strong iron boxes with iron covers provided with padlocks.

2. **Lampholders.**—Lampholders are to be of the Goliath type for lamps consuming more than 300 watts.

3. **Ceiling roses.**—Ceiling roses are to be of non-ignitable non-conducting non-hygroscopic material.

4. **Plugs and sockets.**—(*a*) The live parts of plugs and sockets are to be so proportioned that their average temperature will not rise more than 54° F. (30° C.) above that of the surrounding air when the normal working current is flowing through them continuously.

(*b*) Watertight plugs and sockets are to be employed on weather decks, in stokeholds and engine rooms, and wherever exposed to drip or condensed moisture.

5. **Searchlight lamps.**—(*a*) Searchlight lamps are to have the whole of their live parts insulated from the frame or case.

(*b*) All parts of a searchlight lamp which have to be handled for its operation or adjustment while in use are to be insulated from the circuit with strong, non-ignitable material, of substantial proportions, and be so disposed that there is no risk of shock to the operator.

(*c*) Each searchlight circuit is to be controlled by a fuse on each insulated pole, and by a double-pole linked switch.

6. **Arc lamps.**—(*a*) Arc lamps, other than searchlight lamps, are to have the whole of their live parts insulated from the frame or case.

(*b*) Each arc lamp is to be provided with a globe or lantern arranged to intercept falling particles of carbon, and with wire netting or other means of preventing pieces of broken glass falling.

(*c*) Each arc lamp circuit is to be controlled by a fuse and switch on each insulated pole. Where more than one pole is insulated the switches are to be linked.

(*d*) Arc lamps are not to be fitted in spaces in which combustible goods are stored, or in which inflammable gases may accumulate.

MOTORS.

Section 10. 1. **General Construction.**—(*a*) All working parts are to be readily accessible.

(*b*) All field coils are to be self-contained and readily removable for replacement.

2. **Brushes.**—(*a*) The brushes are to be of carbon, and are to be provided with flexible copper connections.

(*b*) Means are to be provided for the adjustment of the brushes longitudinally, so that they may be staggered in such a manner that in multipolar machines every part of the commutator working surface will be swept by an equal number of positive and negative brushes in order to avoid unequal wear.

3. **Terminals.**—(*a*) Suitable terminals clearly marked and provided with cable sweating sockets are to be provided in an accessible position, convenient for wiring.

(*b*) The terminals are to be so spaced or shielded that they cannot be accidentally earthed, short-circuited, or touched.

(*c*) The frame of every motor is to be provided with a suitable terminal to which the earthing lead is to be connected.

4. **Lubrication.**—Motors are to be efficiently and continuously lubricated automatically with the base of the machine inclined at any angle up to 15 degrees from the horizontal in any and every direction.

5. **Position in Ship.**—(*a*) Motors are, wherever possible, to be placed in well ventilated compartments in which inflammable gases cannot accumulate, and in all cases they are to be fixed clear of all inflammable material. Where these conditions cannot be complied with, motors fitted in such compartments are to be of the flame-proof or forced-draught type, with supply and exhaust pipes or ducts taken outside the compartments.

(*b*) The motors are, as far as possible, to be placed in positions in which they are not exposed to risk of mechanical injury or to damage from water, steam, or oil.

(*c*) Motors required to work under water are to be of the immersible type.

(*d*) Motors essential to the safety of the ship in the event of damage are to be so installed as to be capable of running for a reasonable period after the compartment in which they are situated has been flooded.

(*e*) In all sea-going ships, the motors are, wherever possible, to be placed with their axes of rotation in a fore and aft direction.

(*f*) Unprotected woodwork or other combustible material is not to be fitted within a distance of 12 inches measured horizontally from, or within 4 feet measured vertically above, any motor, unless it be of the totally enclosed, pipe-ventilated, induced-draught, forced-draught, drip- or flame-proof type.

CONTROL GEAR AND RESISTANCES.

Section 11. 1. **General Construction.**—(*a*) Generator field and motor speed regulators, starters, and controllers, are to be constructed wholly of durable, non-ignitable, non-hygroscopic material, and unless otherwise guarded from approach are to be enclosed in non-ignitable cases.

(*b*) All switch parts and protective devices are to be so proportioned that their temperature will not rise more than 54° F. (30° C.) above that of the surrounding air, when the normal working current for which they are designed flows through them continuously.

(*c*) The contact-making faces are to be sufficiently numerous to prevent destructive arcing, and are to be readily renewable without dismantling the gear.

(*d*) Handles and their attachments are to be mechanically strong, and so designed and guarded that the hand of the operator cannot touch live metal.

(*e*) All live parts are to be enclosed by metal covers, which are to be clear of such live parts by not less than $\frac{3}{4}$ inch. Those portions of the cover in proximity to working contacts are to be lined with non-ignitable insulating material.

2. **Resistances.**—(*a*) Resistances are to be so proportioned that they do not rise to such a temperature as seriously to impair their durability.

(*b*) Internal connections are not to be soldered, and all such connections, unless self-supporting or rigidly fixed in position, are to be continuously insulated with porcelain beads.

(*c*) Suitable terminals with cable sockets are to be provided for the attachment of external leads, and are to be so situated that such leads are not exposed at any point to a high temperature.

3. **Position in Ship.**—(*a*) Control gear, wherever possible, is to be placed in positions in which inflammable gases cannot accumulate. Where such conditions cannot be complied with, such apparatus is to be flame-proof.

(*b*) Control gear, as far as possible, is to be placed in positions in which it will not be exposed to risk of mechanical injury or to damage from water, steam, or oil. Where necessarily exposed to such conditions, it is to be totally enclosed.

(*c*) All resistances are to be placed in well-ventilated compartments in which inflammable gases cannot accumulate, and in such positions as to be clear of all inflammable material. Unprotected wood-work or other combustible material is not to be fitted within a distance of 6 inches measured horizontally from, or within 24 inches measured vertically above, the frames or the cases containing them.

INTERNAL COMMUNICATIONS.

Section 12. 1. **Construction of Transforming Plant.**—Motor generators and static transformers used for the reduction of pressure for communication circuits are, together with their control gear, to be constructed in accordance with the regulations for similar plant employed for lighting and power supply.

2. **Batteries.**—Primary and secondary batteries are to be readily accessible at all times. Means are to be provided to prevent liquid from wet primary cells coming into contact with the wooden floor or framework of the ship. Secondary batteries are to be fitted in accordance with **Section 8.**

3. **Construction of Apparatus.**—All apparatus for communications is to be constructed to take the full pressure of the source of supply without the interposition of any external resistance, and, if the pressure of supply exceeds 25 volts, all circuits, switches, resistances, distribution boards and accessories required in connection therewith are to be designed and fitted throughout in all respects in accordance with the regulations for lighting and power circuits.

4. **Communication Cables.**—(*a*) Cables used for the purpose of internal communication are to be of one or other of types specified in **Section 5, clause 1,** and are to be fitted in a similar manner to cables installed for the lighting and power supply of the ship, and they are, as far as possible, to be kept separate unless the lighting and power cables are protected by one or more of the following, with or without braiding overall :—

(i) Lead covering,
(ii) Steel wire armouring,
(iii) Tough rubber sheathing.

(*b*) Communication cables, run in wood casing, are not to be fixed in the same groove as cables supplying lighting and power.

5. **Protection of Circuits.**—In all cases in which secondary batteries, motor generators or static transformers are employed, the main circuit or circuits are to be protected by a fuse or fuses, but fuses need not be fitted in branch circuits if the pressure does not exceed 25 volts or in any circuit supplied from primary batteries.

LIGHTNING CONDUCTORS.

Section 13. Lightning Conductors.—(*a*) Lightning conductors are to be fitted to each mast of all wooden vessels and of steel vessels having wooden masts. They need not be fitted to steel vessels having steel masts.

(*b*) In wooden ships or ships sheathed with wood the lightning conductors are to be composed of a continuous copper tape or rope, having a section not less than 0·15 square inch which is to be riveted or clamped to a suitable copper spike attached to the mast-head. If of tape the lower end is to terminate at the point at which the shrouds leave the mast, and to be securely clamped to a copper rope of not less than $\frac{1}{2}$ inch in diameter. This copper rope is to be led down the shrouds and to be securely clamped to a galvanized iron plate not less than 2 square feet in area fixed well below the light-load water-line and attached to the ship's side.

(*c*) In steel ships fitted with wooden masts the lightning conductors are to be composed of copper tape terminating in a spike, as set forth in paragraph (*b*). At the lower end this copper tape is to be securely attached to the nearest metal forming part of the hull of the ship.

(*d*) In all cases the lightning conductor is to be so run as to avoid sharp bends in the conductor.

(*e*) It is recommended that suitable means should be provided to enable ships when in dry dock to have their lightning conductors connected to an efficient earth on shore.

SPECIAL REQUIREMENTS FOR SHIPS CARRYING OIL HAVING A FLASH POINT LESS THAN 150° F. (65·5° C.).

Section 14. 1. **Nature of Supply.**—The pressure of supply is not to exceed the following values :—

(*a*) With direct current

(i) For power, 220 volts.
(ii) For lighting and heating, 110 volts.

(*b*) With alternating current

For all purposes, 110 volts.

2. **Switchboards.**—(*a*) Each outgoing circuit from the main switchboard and every branch circuit controlling either a junction or section fuse board is to be provided with a double pole linked switch.

(*b*) The cases of all joint boxes, section and distribution boards are to be wholly of metal, and all cables are to enter the cases through watertight glands. Distribution boards in officers' accommodation may be constructed in accordance with **Section 3, clause 7.**

3. **Protective Covering of Cables.**—All cables are to be lead-covered or lead-covered and armoured.

4. **Distribution.**—Main distribution (*i.e.* between switchboards and distribution boards, or between distribution boards and sub-distribution boards) is to be effected wholly on the two-wire two-conductor system with entirely separate cables, both insulated, for the respective poles; no part of the system shall be earthed.

5. **Dangerous Spaces.**—(*a*) Lamps, fittings, appliances of any kind, and wiring are not to be fitted in, or enter, any of the following dangerous spaces: Oil-holds, cofferdams.

(*b*) Pump rooms may be lighted by lamps wired wholly outside the space and separated from the interior by an air-tight stout glass bowl.

(*c*) Lamps in pump-rooms, 'tween decks and spaces immediately adjoining oil-holds are to be contained in gas-tight fittings, the wiring being enclosed in gas-tight tubing. The switches controlling the lamps are to be wholly outside these spaces. These switches are in all cases to be double-pole.

(*d*) Portable lamps other than self-contained battery-fed lamps of a type approved by the Home Office for use in fiery mines are not to be used in dangerous spaces.

SPECIAL REQUIREMENTS TO BE COMPLIED WITH WHERE THE CONSTANT CURRENT SERIES SYSTEM IS USED.

Section 15. 1. **Generators and Motors.**—(*a*) Every generator is to be provided with an automatic circuit closer so arranged as to short-circuit the generator in the event of an open circuit occurring at any point in the system.

(*b*) Generators or motors are not to be of the open type.

2. **Bare Conductors.**—All bare conductors (including radiator elements) are to be totally enclosed in metal cases and all access doors or covers so interlocked that the conductors contained therein will be accessible only when entirely disconnected from the system.

3. **Switches.**—(*a*) The movement of all switches is to be effected without breaking the main circuit.

(*b*) When a current consuming device is "switched-off" by its main switch it shall be totally disconnected on both poles from the system.

4. **Earthing.**—No part of the system is to be earthed.

TRIALS.

Section 16.—Before the installation is put into service the following tests are to be carried out :—

1. **Insulation Resistance.**—(*a*) The insulation resistance is to be measured by applying a direct-current pressure not less than twice the working pressure between earth and the whole system of conductors and any section thereof, with all lamps and fuses in place, and all switches on.

(*b*) The insulation resistance of the lighting circuits so measured is not to be less in megohms than 10 divided by the number of points on those circuits, except that the insulation resistance of any final lighting sub-circuit need not exceed 1 megohm.

(*c*) The insulation resistance between the case or framework and every live part of each individual dynamo, motor, heater, arc lamp or other appliance, complete with its switch and control gear, regulating resistance and similar accessories, is not to be less than half a megohm.

2. **Running Order.**—All generators are to be run in turn or simultaneously; all main switches and current breakers are to be operated, and all lamps, heaters, motors and other appliances run, though not necessarily under full load or simultaneously. During this test everything is to operate satisfactorily, and the specified drop in pressure on any part of the installation is not to exceed that laid down in **Section 4, clause 4.**

This trial is to be in addition to, and not in substitution for, the acceptance trials of the individual items of plant at the makers' works.

PERIODICAL SURVEYS.

Section 17.—The periodical surveys of Electric Fittings are detailed on page 23.

Section 18. FEES FOR THE INSPECTION OF THE INSTALLATION OF ELECTRICAL FITTINGS.

The following Scale of Fees has been adopted for the inspection of the installation of Electrical Fittings in the United Kingdom, viz. :—

£1	per kilowatt	for the first	15	kilowatts,		
10s.	„	each kw. above	15	and up to	30	kilowatts,
5s.	„	„	30	„	50	„
2s.	„	„	50	„	80	„
1s.	„	„	80	„	200	„
6d.	„	„	200	kilowatts.		

Minimum fee £5.

(The scale is based on the kilowatts of the generators.)

In the case of Tugs with small installations not exceeding 6 kilowatts, the fee is to be £3.

By order of the Committee,

ANDREW SCOTT,

Secretary.

71, Fenchurch Street, London, E.C.3

24th April, 1930.

Table I.

Current-carrying Capacity (subject to voltage drop) and Corresponding Fall of Pressure—Single Cables.

Nominal Area of Conductor.	Effective Area of Conductor.	Number and Diameter (in.) of Wires comprising Conductor.	Insulated with Rubber.		Insulated with Paper.	
			Maximum Permissible Current.	Approx. Length (lead plus return) giving 1 volt drop with current (Col. 4.)	Maximum Permissible Current.	Approx. Length (lead plus return) giving 1 volt drop with current (Col. 6.)
1.	2.	3.	4.	5.	6.	7.
sq. in.	sq. in.		amps.	ft.	amps.	ft.
0·0010	0·00102	1/·036	4·1	30	4·1	30
0·0015	0·00152	1/·044	6·1	30	6·1	30
0·0020	0·00194	3/·029	7·8	30	7·8	30
0·0030	0·00299	3/·036	12·0	29	12·0	29
0·0030	0·00322	1/·064	12·9	29	12·9	29
0·0045	0·00455	7/·029	18·2	28	18·2	28
0·0070	0·00701	7/·036	24·0	33	28·0	27
0·0100	0·01046	7/·044	31·0	39	42·0	27
0·0145	0·01462	7/·052	37·0	45	57·0	28
0·0225	0·02214	7/·064	46·0	55	75·0	32
0·0300	0·02840	19/·044	53·0	61	87·0	35
0·0400	0·03960	19/·052	64·0	71	104·0	41
0·0600	0·06000	19/·064	83·0	83	135·0	48
0·0750	0·07592	19/·072	97·0	90	157·0	52
0·1000	0·10090	19/·083	118·0	98	191·0	57
0·1200	0·11680	37/·064	130·0	103	210·0	60
0·1500	0·14780	37/·072	152·0	112	246·0	65
0·2000	0·19640	37/·083	184·0	123	296·0	72
0·2500	0·24650	37/·093	214·0	132	343·0	78
0·3000	0·30240	37/·103	240·0	145	385·0	85
0·4000	0·40640	61/·093	288·0	162	464·0	95
0·5000	0·49850	61/·103	332·0	172	540·0	100
0·6000	0·60620	91/·093	384·0	181	624·0	105
0·7500	0·74350	91/·103	461·0	185	738·0	109
0·8500	0·84590	127/·093	512·0	190	815·0	116
1·0000	1·03760	127/·103	595·0	200	932·0	121

Lloyd's Register of Shipping, London.—*24th April*, 1930.

Table II.

Current-carrying Capacity and Corresponding Fall of Pressure—Twin Flexible Cords and Cables.

Nominal Area of Conductor.	Composition of Strand.	Maximum Current Permissible (subject to voltage drop).	Approximate length (lead plus return) giving 1 volt drop with current (Col. 3).
1.	2.	3.	
sq. in.	No. and diam. in.	amps.	feet.
0·0006	14/0·0076	1·8	59
0·001	23/0·0076	3·0	59
0·0017	40/0·0076	5·0	57
0·003	70/0·0076	8·5	57
0·0048	110/0·0076	13·0	56
0·007	162/0·0076	17·0	69

Table III.

Current-Carrying Capacity for Intermittent Working—Cables.

Nominal Area of Conductor.	Permissible Current.					
	Rubber Cables.			Paper Cables.		
	Half-hour Rating.	One-hour Rating.	Continuous Rating as in Table I.	Half-hour Rating.	One hour Rating.	Continuous Rating as in Table I.
1.	2.	3.	4.	5.	6.	7.
sq. ins.	amps.	amps.	amps.	amps.	amps.	amps.
0·0145	38	37	37	60	57	57
0·0225	47	46	46	79	75	75
0·030	56	54	53	94	89	87
0·04	68	65	64	113	105	104
0 06	92	85	83	151	138	135
0·075	113	101	97	180	162	157
0·1	142	124	118	225	199	191
0·12	160	138	130	252	220	210
0·15	191	164	152	303	261	246
0·2	247	204	184	376	320	296
0·25	295	244	214	453	377	343
0·3	351	283	240	523	435	385
0·4	452	357	288	663	543	464
0·5	534	422	332	804	648	540
0·6	641	499	384	960	767	624
0·75	774	604	461	1,180	930	738
0·85	900	680	512	1,325	1,045	815
1·0	1,036	803	595	1,548	1,211	932

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Table IV.

Dimensions of Single-Core Cables—Rubber Insulated.

For (*a*) Direct-current systems for pressures not varying from the potential of the ship's hull by more than 250 volts.
(*b*) Three-phase systems, with centre point earthed, for pressures of not more than 500 volts between phases.

Conductors.		Dielectric.	Braided Cables.	Braided and Armoured Cables.			Lead-covered Cables.		Lead-covered and Armoured Cables.		
Nominal Area.	Overall Diameter.	Thickness.	Overall Diameter.	Diameter of Armouring Wire.	Diameter over Armour.	Diameter over Armour and Braiding.	Thickness of Lead.	Diameter over Lead.	Diameter of Armouring Wire.	Diameter over Armour.	Diameter over Armour and Braiding.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
sq. in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
0·0010	0·036	0·034	0·165	0·064	0·328	0·418	0·040	0·200	0·064	0·408	0·498
0·0015	0·044	0·034	0·173	0·064	0·336	0·426	0·040	0·208	0·064	0·416	0·506
0·0020	0·063	0·036	0·195	0·064	0·358	0·448	0·040	0·230	0·064	0·438	0·528
0·0030	0·078	0·038	0·215	0·064	0·378	0·468	0·040	0·250	0·064	0·458	0·548
0·0030	0·064	0·036	0·197	0·064	0·360	0·450	0·040	0·232	0·064	0·440	0·530
0·0045	0·087	0·039	0·226	0·064	0·389	0·479	0·040	0·261	0·064	0·469	0·559
0·0070	0·108	0·041	0·259	0·064	0·422	0·512	0·050	0·314	0·064	0·522	0·612
0·0100	0·132	0·043	0·287	0·064	0·450	0·540	0·050	0·342	0·064	0·550	0·640
0·0145	0·156	0·046	0·317	0·064	0·480	0·570	0·060	0·392	0·064	0·600	0·690
0·0225	0·192	0·049	0·359	0·064	0·522	0·612	0·060	0·434	0·072	0·698	0·788
0·0300	0·220	0·052	0·393	0·064	0·556	0·646	0·060	0·468	0·072	0·732	0·822
0·0400	0·260	0·056	0·441	0·064	0·604	0·694	0·060	0·516	0·072	0·780	0·870
0·0600	0·320	0·062	0·513	0·072	0·732	0·822	0·070	0·608	0·072	0·872	0·962
0·0750	0·360	0·066	0·596	0·072	0·780	0·870	0·070	0·656	0·072	0·920	1·010
0·1000	0·415	0·072	0·663	0·072	0·847	0·937	0·070	0·723	0·072	0·987	1·077
0·1200	0·448	0·075	0·702	0·072	0·886	0·976	0·070	0·762	0·072	1·026	1·146
0·1500	0·504	0·080	0·768	0·072	0·952	1·042	0·080	0·848	0·080	1·208	1·328
0·2000	0·581	0·088	0·889	0·072	1·053	1·173	0·080	0·949	0·080	1·309	1·429
0·2500	0·651	0·095	0·973	0·080	1·233	1·353	0·090	1·053	0·104	1·461	1·581
0·3000	0·721	0·102	1·057	0·080	1·317	1·437	0·090	1·137	0·104	1·545	1·665
0·4000	0·837	0·114	1·197	0·104	1·505	1·625	0·100	1·297	0·104	1·705	1·825
0·5000	0·927	0·121	1·301	0·104	1·609	1·729	0·110	1·421	0·128	1·877	1·997
0·6000	1·023	0·125	1·425	0·128	1·761	1·881	0·110	1·525	0·128	1·981	2·101
0·7500	1·133	0·131	1·547	0·128	1·883	2·003	0·120	1·667	0·160	2·187	2·307
0·8500	1·209	0·135	1·631	0·128	1·967	2·087	0·120	1·751	0·160	2·271	2·391
1·0000	1·339	0·141	1·773	0·128	2·173	2·293	0·120	1·893	0·160	2·413	2·533

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TABLE V.

DIMENSIONS OF CABLES–660 VOLT PAPER INSULATED

Conductors.		Di-electric.	Single-core. Lead Covered Cables.		Single-core, Lead-covered and Armoured Cables (Single-wire Armouring).	
Nominal Area.	Overall Diameter.	Thickness.	Thickness of Lead.	Diameter over Lead.	Diameter of armouring wire.	Diameter over Armour.
1.	2.	3.	4.	5.	6.	7.
sq. in.	in.	in.	in.	in.	in.	in.
0·0015	0·044	0·080	0·045	0·324	0·064	0·532
0·0020	0·062	0·080	0·045	0·343	0·064	0·551
0·0030	0·078	0·080	0·045	0·358	0·064	0·566
0·0030	0·064	0·080	0·045	0·344	0·064	0·552
0·0045	0·087	0·080	0·050	0·367	0·064	0·575
0·0070	0·108	0·080	0·060	0·388	0·064	0·596
0·0100	0·132	0·080	0·060	0·412	0·072	0·676
0·0145	0·156	0·080	0·060	0·436	0·072	0·700
0·0225	0·192	0·080	0·060	0·472	0·072	0·736
0·0300	0·220	0·080	0·060	0·500	0·072	0·764
0·0400	0·260	0·080	0·060	0·540	0·072	0·804
0·0600	0·320	0·080	0·070	0·620	0·072	0·884
0·0750	0·360	0·080	0·070	0·660	0·072	0·924
0·1000	0·415	0·080	0·070	0·715	0·072	0·979
0·1200	0·448	0·080	0·070	0·748	0·072	1·012
0·1500	0·504	0·080	0·070	0·804	0·080	1·164
0·2000	0·581	0·080	0·070	0·881	0·080	1·241
0·2500	0·651	0·090	0·080	0·991	0·080	1·351
0·3000	0·721	0·090	0·080	1·061	0·104	1·469
0·4000	0·837	0·100	0·090	1·217	0·104	1·625
0·5000	0·927	0·100	0·090	1·307	0·128	1·763
0·6000	1·023	0·100	0·100	1·423	0·128	1·879
0·7500	1·133	0·110	0·100	1·553	0·128	2·009
0·8500	1·209	0·110	0·110	1·649	0·160	2·169
1·0000	1·339	0·110	0·110	1·779	0·160	2·299

TABLE VI.

THICKNESSES AND TYPES OF BEDDING FOR SINGLE-WIRE ARMOURING.

Diameter of Cable to be armoured, exclusive of Bedding.	Minimum Thickness of Bedding.	Type of Bedding to be used.
	inch.	
Up to and including 0·4 inch.	0·040	Two coats of hessian tape.
0·4 inch to 0·8 inch	0·060	Two coats of hessian tape or two coats of jute yarn.
Above 0·8 inch ...	0·100	Three coats of hessian tape or two coats of jute yarn.

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Table VII.
Insulation Resistance of Rubber Insulated Cables.

Nominal Area of Cable.	Minimum Insulation Resistance			
	Megohms for a 1,000 yard length at 60° F. (15·6° C.) 600-megohm Grade.	Megohms for a mile length at 60° F. (15·6° C.) 600-megohm Grade	Megohms for a 1,000 yard length at 60° F. (15·6° C.) 2,500-megohm Grade.	Megohms for a mile length at 60° F. (15·6° C.) 2,500-megohm Grade.
sq. in.				
0·0010	3,520	2,000	8,800	5,000
0·0015	3,520	2,000	8,800	5,000
0·0020	2,200	1,250	7,920	4,500
0·0030	2,200	1,250	7,920	4,500
0·0030	3,520	2,000	8,800	5,000
0·0045	2,200	1,250	7,920	4,500
0·0070	1,584	900	7,040	4,000
0·0100	1,584	900	7,040	4,000
0·0145	1,584	900	7,040	4,000
0·0225	1,584	900	6,160	3,500
0·0300	1,320	750	6,160	3,500
0·0400	1,320	750	5,280	3,000
0·0600	1,320	750	5,280	3,000
0·0750	1,056	600	5,280	3,000
0·1000	1,056	600	5,280	3,000
0·1200	1,056	600	5,280	3,000
0·1500	1,056	600	5,280	3,000
0·2000	1,056	600	4,400	2,500
0·2500	1,056	600	4,400	2,500
0·3000	1,056	600	4,400	2,500
0·4000	1,056	600	4,400	2,500
0·5000	1,056	600	4,400	2,500
0·6000	1,056	600	4,400	2,500
0·7500	1,056	600	4,400	2,500
0·8500	1,056	600	4,400	2,500
1·0000	1,056	600	4,400	2,500

Table VIII.
Maximum Spacing of Clips securing Lead-Covered or Armoured Cables.

Overall Diameter of Cable.	Lead-covered.	Armoured.
	Inches.	Inches.
Under 0·3 inch	8	10
0·3 inch and under 0·5 inch	10	12
0·5 „ „ 0·75 „	12	14
0·75 „ „ 1·25 „	14	16
1·25 inches and above ...	16	18

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Table IX.

Approximate Fusing Currents of Copper Wires in Free Air.

Diameter of Wire. 1.	Equivalent S.W.G. Size. 2.	Fusing Current. 3.	Maximum Safe Working Current. 4.
inch.		amperes.	amperes.
0·0092	34	8·6	4·3
0·01	33	9·8	4·9
0·0108	32	11·0	5·5
0·012	—	12·8	6·4
0·0124	30	13·5	6·8
0·0148	28	17	8·6
0·018	26	22	11
0·022	24	30	15
0·028	22	41	21
0·029	—	43	22
0·036	20	62	31
0·04	19	73	37
0·044	—	86	43
0·048	18	98	49
0·052	—	111	56
0·056	17	125	63
0·064	16	156	78
0·072	15	191	96
0·08	14	229	115

Table X.

Approximate Fusing Currents of Lead-Tin Alloy (Lead 75 per cent, Tin 25 per cent) Wires in Free Air.

Diameter of Wire. 1.	Equivalent S.W.G. Size. 2.	Fusing Current 3.	Maximum Safe Working Current. 4.
inch.		amperes.	amperes.
0·02	25	3	2·0
0·022	24	3·5	2·3
0·024	23	4	2·6
0·028	22	5	3·3
0·032	21	6	4·1
0·036	20	7	4·8
0·048	18	10	7·0
0·064	16	16	11·0

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Table XI.

Standard Thicknesses of Dielectric and Lead Sheathing for Varnished Cambric Cables for Pressures up to 660 Volts.

Nominal Area of Conductor.	Number and Diam. (in.) of Wires comprising Conductor.	Thickness of Dielectric.	Thickness of Lead Sheathing.		
			Single.	Twin.	Three-core
sq. in.		inch.	inch.	inch.	inch.
0·003	3/·036	0·08	0·06	0·07	0·07
0·003	1/·064	0·08	0·06	0·07	0·07
0·0045	7/·029	0·08	0·06	0·07	0·07
0·007	7/·036	0·08	0·06	0·07	0·07
0·01	7/·044	0·08	0·06	0·07	0·07
0·0145	7/·052	0·08	0·06	0·07	0·08
0·0225	7/·064	0·08	0·06	0·07	0·08
0·03	19/·044	0·08	0·06	0·08	0·08
0·04	19/·052	0·08	0·06	0·08	0·09
0·06	19/·064	0·08	0·07	0·08	0·09
0·075	19/·072	0·08	0·07	0·08	0·09
0·1	19/·083	0·08	0·07	0·09	0·1
0·12	37/·064	0·08	0·07	0·09	0·1
0·15	37/·072	0·08	0·07	0·09	0·1
0·2	37/·083	0·08	0·07	0·1	0·11
0·25	37/·093	0·09	0·08	0·11	0·12
0·3	37/·103	0·09	0·08	0·12	0·13
0·4	61/·093	0·1	0·09	0·13	0·14
0·5	61/·103	0·1	0·09	0·14	0·15
0·6	91/·093	0·1	0·1	—	—
0·75	91/·103	0·11	0·1	—	—
0·85	127/·093	0·11	0·11	—	—
1·0	127/·103	0·11	0·11	—	—

Table XII.

Standard Carrying Capacities of Varnished Cambric Cables for Pressures up to 660 Volts.

Nominal Area of Conductor	Number and Diameter (in.) of Wires comprising Conductor.	Continuous Rating.			Intermittent Rating.	
					Single in Pairs.	
		Single in Pairs.	Twin.	Three-core.	Half-hour.	One-hour.
sq. in.		amps.	amps.	amps.	amps.	amps.
0·003	3/·036	10·8	10·8	10·8	—	—
0·003	1/·064	11·6	11·6	11·6	—	—
0·0045	7/·029	16·4	16·2	16·2	—	—
0·007	7/·036	25	23	21	—	—
0·01	7/·044	38	31·5	28	—	—
0·0145	7/·052	51	40	37	54	51
0·0225	7/·064	68	54	50	71	68
0·03	19/·044	78	64	59	84	80
0·04	19/·052	94	76	70	102	95
0·06	19/·064	122	103	91	136	124
0·075	19/·072	141	117	105	162	146
0·1	19/·083	172	141	128	203	179
0·12	37/·064	189	157	145	226	198
0·15	37/·072	222	180	167	273	235
0·2	37/·083	266	218	204	338	288
0·25	37/·093	309	252	238	407	340
0·3	37/·103	346	290	274	470	392
0·4	61/·093	417	354	—	596	488
0·5	61/·103	486	412	—	723	584
0·6	91/·093	561	—	—	864	690
0·75	91/·103	664	—	—	1,061	838
0·85	127/·093	733	—	—	1,190	940
1·0	127/·103	839	—	—	1,390	1,090

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Table XIII.

Dimensions of Tough Rubber Sheathed Cables.

For: (*a*) Direct-current systems for pressures not varying from the potential of the ship's hull by more than 250 volts.

(*b*) Three-phase systems, with centre point earthed, for pressures of not more than 500 volts between phases.

Thicknesses of Dielectric, and Tough Rubber Sheath.

Nominal Area of Conductor	Number and Diameter of Wires	D. Thickness of Dielectric	Thickness of Tough Rubber Sheath			
			Single	Twin (Circular)	Twin (Flat)	Three Core
1.	2.	3.	4.	5.	6.	7.
sq. in.	in.	in.	in.	in.	in.	in.
0·001	1/·036	0·034	0·05	0·05	0·05	0·05
0·0015	1/·044	0·034	0·05	0·05	0·05	0·05
0·002	3/·029	0·036	0·05	0·06	0·06	0·06
0·003	3/·036	0·038	0·05	0·06	0·06	0·06
0·003	1/·064	0·036	0·05	0·06	0·06	0·06
0·0045	7/·029	0·039	0·05	0·06	0·06	0·06
0·007	7/·036	0·041	0·05	0·06	0·06	0·06
0·01	7/·044	0·043	0·05	0·06	0·06	0·06
0·0145	7/·052	0·046	0·05	0·06	0·06	0·08
0·0225	7/·064	0·049	0·06	0·08	0·08	0·08
0·03	19/·044	0·052	0·06	0·08	0·08	0·08
0·04	19/·052	0·056	0·06	0·1	0·1	0·1
0·06	19/·064	0·062	0·06	0·1	0·1	0·1
0·075	19/·072	0·066	0·06	0·1	0·1	0·12
0·1	19/·083	0·072	0·08	0·12	0·12	0·12
0·12	37/·064	0·075	0·08	0·12	0·12	0·13
0·15	37/·072	0·08	0·08	0·13	0·13	0·13
0·2	37/·083	0·088	0·1	0·15	0·15	0·15
0·25	37/·093	0·095	0·1	0·15	—	0·175
0·3	37/·103	0·102	0·1	0·175	—	0·175
0·4	61/·093	0·114	0·12	0·2	—	0·225
0·5	61/·103	0·121	0·12	0·225	—	0·25
0·6	91/·093	0·125	0·13	0·25	—	0·25
0·75	91/·103	0·131	0·13	0·25	—	0·25
0·85	127/·093	0·135	0·13	0·25	—	0·25
1·0	127/·103	0·141	0·15	0·25	—	0·25

D is the thickness of the dielectric as follows:—

(1) On the Conductor of single Conductor Cables.

(2) On each Conductor of Concentric Cables.

(3) On each core of Twin and Three-Core Cables.

RULES FOR REFRIGERATING MACHINERY AND APPLIANCES.

GENERAL.

Section 1. 1. On the application of the owners of vessels fitted, or to be fitted, for carrying refrigerated cargoes, the Committee will authorise their Surveyors to survey the refrigerating machinery and appliances, and in those cases where the following conditions are complied with and a satisfactory report is received from the Surveyor, certificates of these surveys will be issued and the notation of Lloyd's R.M.C. (*in red*) (*i.e.* Lloyd's Refrigerating Machinery Certificate) will be made against the vessel's name in the Society's Register Book, and in the special list of vessels fitted with refrigerating machinery and appliances. In cases in which the refrigerating machinery and appliances are constructed under the special survey of the Society's Surveyors, and to their entire satisfaction, the notation ✠ Lloyd's R.M.C. (*in red*) will be made in the Register Book. The number of refrigerating units, number of compressors, the system of refrigeration, the name of the maker and date of the construction of the machines, the method employed for cooling the chambers and the nature of the insulation, the cubic feet of air delivered per hour and the refrigeration or ice melting capacity in tons per 24 hours, and the number and total capacity of the insulated cargo chambers in cubic feet, will be recorded in the special list in the Register Book.

2. **Submission of Plans.**—In cases where the refrigerating machinery and appliances are to be constructed under special survey, plans or specifications are to be submitted for consideration.

NOTE:—A refrigerating unit comprises a prime mover, one or more compressors, one condenser and one evaporator or cooler, where these are employed.

If the prime mover is a steam engine and each cylinder drives a corresponding compressor, or if there is more than one motor similarly arranged and each compressor is connected to its own condenser and evaporator or cooler (not necessarily in separate casings), these machines are to be described as two or more units, as the case may be, provided each unit can be used either in combination or separately.

If a machine has more than one compressor, but is driven by a single prime mover and has only one condenser and one evaporator or cooler, it is to be described as one unit with one or more compressors.

In the case of compound compressors the high and low pressure cylinders are to be considered as a single compressor.

"NOTE.—The refrigeration or ice-melting capacity of the machines in tons per 24 hours should be calculated at the rate of 318,080 B.T.U. per English ton (*i.e.* 2,240 pounds) with temperature of evaporation = 5° F. (− 15° C.), and temperature of liquid refrigerant in the condenser = 86° F. (30° C.)."

REFRIGERATING MACHINERY.

Section 2. 1. **Power of Machinery.**—The refrigerating machinery is to be of approved construction and of sufficient power to maintain the necessary low temperature in the cargo chambers in tropical climates when running 18 hours per day. For cargo capacities of above 70,000 cubic feet, the machinery is to be fitted with more than one refrigerating unit.

2. **Motive Power.**—Except in the cases of small vessels, the motive power of the refrigerating plant is to be supplied from not less than two sources, each source being capable of supplying sufficient power when the installation is under full working conditions.

3. **Hydraulic and other Tests.**—In the case of new refrigerating machinery and appliances, the tests recommended for the various parts are as follows, viz.:—

(*a*) CO_2 compressors, separators, condenser and evaporator coils, headers and connections to be tested by hydraulic pressure to 3,000 lbs. per square inch, and afterwards by air pressure to 1,500 lbs. per square inch whilst submerged in water at 90° F.

(*b*) NH_3 compressors and cast iron or steel connections to be tested by hydraulic pressure to 600 lbs. per square inch.

(*c*) NH_3 condenser, evaporator and air cooler coils to be tested by hydraulic pressure to 1,500 lbs. per square inch, and afterwards by air pressure to 500 lbs. per square inch whilst submerged in water at 90° F.

(*d*) NH_3 condenser, evaporator and air cooler coils to be tested after erection in place by air pressure to 200 lbs. per square inch.

(*e*) Brine piping, after erection in place, to be tested by air pressure to 90 lbs. per square inch.

(*f*) Gas evaporator casings of cast iron and gas condenser casings, whether of cast iron or steel, to be tested by hydraulic pressure to 15 lbs. per square inch, or to double the working pressure, whichever is the greater.

(*g*) Gas evaporator, wrought iron and steel casings, to be tested by hydraulic pressure to 30 lbs., if gravitation type, or to 50 lbs. per square inch if pressure type, or to double the working pressure, whichever is the greater.

4. **Cooling Tests.**—Upon completion of the installation under special survey the refrigerating machinery is to be tested under working conditions and the insulated chambers are to be cooled down simultaneously to about 10° F. where they are intended for carrying frozen and chilled meat cargoes, and to about 20° F. where they are intended for carrying fruit and similar produce which require only moderate temperatures. The rise of temperature in the refrigerated chambers is to be noted upon the expiration of about 12 hours time after the machinery and cooling appliances have been shut off.

INSULATION AND FITTINGS.

Section 3. 1. **Insulation.**—The insulation is to be sound and in good order and of efficient construction. The details of construction showing the amount and nature of the insulating material employed in the various parts are to be reported to the Committee.

2. **Protection of Insulation.**—It is recommended that the insulation of the lower hold chamber floor and the tunnel top in way of the hatchways and about two feet beyond be protected with hardwood sheathing about 2 inches thick. Where charcoal, silicate cotton, granulated cork or similar media are employed, the woodwork of the insulation over the tunnel tops be fastened with screws to facilitate the examination of this part. The woodwork at the corners of all insulated hatchway coamings, trunkway door frames, and the insulation at the top of the hold pillars in way of the hatchways be protected from damage by cargo ropes by means of galvanised iron or steel plates.

3. **Access Plugs.**—Insulated removable portions are to be arranged in the insulation, where required, to provide easy access to the bilge suction roses. Similar provision to be made for access to the tank air and sounding pipes and also for examination of the heels of the pillars.

4. **Oil Storage Tank Bulkheads.**—The insulation of bulkheads in way of oil storage tanks is to be provided with an air space of not less than 2 inches between the insulation and the bulkhead plating permitting free drainage from the latter into the oil gutterways and thence to the bilges. Provision to be made for ventilating the air space, the vents being led to the open air and their outlets being fitted with a wire gauze diaphragm which can be easily removed for renewal.

5. **Coal Bunker Bulkheads.**—The insulation of bulkheads in way of coal bunkers and of brine outflow and return pipes passing through coal bunkers should be, so far as practicable, fireproof.

6. **Watertight Bulkhead Fittings.**—Where cooling pipes pass through watertight bulkheads, or deck plating, the fittings and packing of the stuffing boxes are to be both fireproof and watertight.

7. **Cargo Battens.**—(*a*) Cargo battens are to be provided for the floor or deck and the walls of the chambers previous to loading refrigerated cargoes.

(*b*) Those for the walls of the chambers are to be fastened and should be at least 2″ × 2″, one batten being placed over each frame or ground, the others being intermediately arranged, or alternatively, about 14″ centres.

(*c*) The cargo battens for the floors or decks of the chambers should be in no case less than 2″ × 2″ but preferably 3″ × 3″; these battens need not be made a fixture and such battens are not required where the cargo is suspended as in the case of chilled meat.

(*d*) The tunnel top insulation is to be fitted with 3″ × 3″ battens of elm or hard wood of similar nature.

8. **Thermometer Tubes.**—(*a*) The number and position of the thermometer tubes of the insulated chambers should be submitted for consideration.

(*b*) Thermometer tube flanges and covers are to be insulated from the deck plating and so arranged that water will not run down and freeze in the tubes when taking the temperatures.

(*c*) The inside diameter of the thermometer tubes should be not less than 2½ inches.

(*d*) Where the thermometer tubes and cooling pipes pass through compartments or chambers other than their respective insulated chambers they are to be efficiently insulated, except where they pass through brine tank rooms or evaporator rooms.

9. **Protection of Pipes.**—All pipes, including air and sounding pipes, which pass through or into insulated chambers are to be well insulated in order to prevent the formation of ice inside the pipes.

10. **Draining Arrangements.**—(*a*) Where insulated chambers are situated below the load water line provision is to be made for draining the inside of the chambers into their respective hold bilges or bilge wells by means of insulated non-return valves or liquid sealed non-return bilge traps, and sounding pipes, or their equivalent, are to be fitted in the chambers.

(*b*) Where practicable, sluices, scupper or drain pipes, which may permit drainage from compartments outside the insulated chambers into the bilges of the latter, should not be fitted; but, in the event of their being fitted, means are to be provided for blanking them off when the chambers are being used for carrying refrigerated cargoes.

11. **Sounding Pipes.**—Where sounding pipes are fitted in way of insulated chambers it is recommended that their deck connections be so arranged that they will be insulated from the deck plating in order to prevent the formation of ice inside the sounding pipes.

12. **Brine Cooling Systems.**—(*a*) Where the brine system of refrigeration is employed the brine circulating pipes and tanks should not be galvanised on the inside.

(*b*) In cases where internally galvanised tanks or cooling pipes are fitted, the brine cooling and return tanks, if closed, are each to be provided with a ventilating pipe or pipes led to the open air in a situation where no danger will be incurred from the issuing gas, and each ventilating pipe must be fitted with a wire gauze diaphragm which can be easily removed for renewal.

(*c*) Where the tanks are not closed, the compartments in which they are situated must be efficiently ventilated.

SPARE GEAR.

Section 4. 1. A sufficient amount of spare gear is to be supplied and stowed where it is readily accessible.

2. Where two or more complete sets of refrigerating machines are connected to all the refrigerated chambers and one of these machines is additional to the power required to maintain the necessary low temperature in the chambers in tropical climates when running 18 hours per day, provided all the working parts of these machines are interchangeable, no spare gear will be required.

3. Where two similar machines are fitted, each connected to different sets of refrigerated chambers, one set of spare gear suitable for either machine will suffice.

4. Where only one single dry air machine is fitted the following spare gear will be required :—

1 crank shaft with eccentric sheaves, complete, or one half shaft if the halves are interchangeable.
1 piston rod and nuts for steam and air cylinders.
1 set of piston rod and connecting rod brasses.
1 piston, complete, for each steam and air cylinder.
1 cylinder cover for each pattern used in steam and air cylinders.
1 air pump bucket and rod.
1 water circulating pump bucket and rod.
1 pair of main bearing brasses, complete.
Main and cut-off valves for each steam cylinder.
Balance springs and rings for steam and air slide valves.
False valve face for each pattern fitted in steam cylinders, with screws.
1 eccentric rod for each pattern used.
1 eccentric strap for each pattern used.
1 slide valve spindle and nuts for steam and air cylinders, for each pattern used.
2 main bearing bolts.
1 set of connecting rod and piston rod bolts.
Full set of air valves and seats for air compressor.
1 set of inlet and outlet valves, and 1 set of valve faces (if fitted) for air expansion cylinder with screws.
1 set of valves for air, water circulating and feed pumps.
1 set of escape valve springs.
50 suction springs.
50 delivery springs.
50 buffer springs.
6 tubes and 24 ferrules for condenser.
6 tubes for cooler.
6 tubes for air drying chamber.
Assorted bolts, studs and nuts.
1 set of lead lined nuts for air expansion cylinder cover.
A quantity of packings and joint rings.

5. Where one machine having two sets of air compressor and expansion cylinders or two single dry air machines are fitted and these can be connected to all the refrigerated chambers the following spare gear will be required :—

1 crank shaft with eccentric sheaves complete, or one half shaft if the halves are interchangeable.
1 piston rod and nuts for steam and air cylinders.
1 set of connecting rod and crosshead brasses.
1 piston for H.P. steam cylinder.
1 piston, complete, for air compressor ; and 1 for air expansion cylinder.
1 set of piston springs for each steam cylinder.
1 cylinder cover for each pattern used in air compression and expansion cylinders.
1 air pump bucket and rod.
1 water circulating pump bucket and rod.
Main and cut-off slide valves and spindles with nuts complete for H.P. steam cylinder.
Balance springs and rings for steam and air slide valves.
1 H.P. steam cylinder valve and valve face with screws.
1 eccentric sheave, strap, and rod for each pattern used.
1 slide valve spindle and nuts for steam and air cylinders for each pattern used.
2 main bearing bolts.
1 set of connecting rod and piston rod bolts.
Half set of air valves and seats for air compressor.
1 inlet and 1 outlet valve, and 1 half set of valve faces (if fitted) for air expansion cylinder, with screws.
1 set of valves for air, water circulating, and feed pumps.
1 set of escape valve springs.
20 suction springs.
40 delivery springs.
40 buffer springs.
6 tubes and 24 ferrules for condenser.
6 tubes for cooler and 6 for air drying chamber.
Assorted bolts, studs and nuts.
½ set of lead lined nuts for air expansion cylinder covers.
A quantity of packings and joint rings.

6. Where only one single gas compression machine is fitted, the following spare gear will be required :—

1 crank shaft with eccentric sheaves, complete, or one half shaft if the halves are interchangeable.
Piston and rods complete with nuts for each steam cylinder and gas compressor.
1 air pump bucket and rod.
1 water circulating pump bucket and rod.
1 pair main bearing brasses, complete.
1 set of connecting rod and crosshead brasses.
Main and cut-off valves for steam cylinders.
1 valve spindle and nuts, complete, for each pattern used.
1 eccentric strap and rod for each pattern used.
1 additional brine pump to be fitted and connected ready for use.
1 cover for each pattern used, except where forged steel covers or screwed plugs are used for the gas compressor.
2 main bearing bolts.
1 set of connecting rod and piston rod bolts.
1 set of compressor suction and delivery valves with springs and boxes, complete.
1 set of valves for air, water circulating, feed, and brine pumps.
1 set of blocks for making all leather packings used.
6 tubes and 24 ferrules for condenser.
Lengths and bends of piping of each size used, together with flanges, couplings, and screwing apparatus for effecting repairs.
1 gas regulating valve complete.
1 distributing and 1 collecting piece with multiple branches for coils for each pattern used. If these pieces are made of forged steel no spare pieces are required.
Sundry valves, cocks, flanges, and fittings.
Assorted bolts, studs, and nuts.
A quantity of leather packings and joint rings.
1 complete set of metal rings for the compressor if metallic packing is used.

7. Where one machine having two, or more, gas compressors is fitted the following spare gear will be required :—

1 crank shaft, or one section of shaft if the sections are interchangeable.
1 steam piston rod and nut for each pattern used.
1 piston for H.P. steam cylinder, with springs, complete.
1 set of piston rings for each steam cylinder.
1 set of piston rings for each size of compressor.
1 compressor piston rod and nuts, complete, for each pattern used.
1 air pump bucket and rod.
1 water circulating pump bucket and rod.
Main and cut-off slide valves for each H.P. steam cylinder.

Main and cut-off valve spindles and nuts for H.P. steam cylinder.

1 eccentric sheave, strap, and rod, for each pattern used.

1 additional brine pump to be fitted and connected ready for use.

1 cover for each end of gas compressor, except where forged steel covers or screwed plugs are used.

2 main bearing bolts.

½ set of connecting rod and piston rod bolts.

½ set compressor suction and 1 delivery valve with springs and box, complete.

1 set of valves for air, water circulating, feed, and brine pumps.

1 set of blocks for making all leather packings used.

6 tubes and 24 ferrules for condenser.

Lengths and bends of piping of each size used, together with flanges, couplings, and screwing apparatus for effecting repairs.

1 gas regulating valve, complete.

1 distributing and 1 collecting piece with multiple branches for coils for each pattern used. If these pieces are made of forged steel, no spare pieces are required.

Sundry valves, cocks, flanges and fittings.

Assorted bolts, studs and nuts.

A quantity of leather packings and joint rings.

1 complete set of metal rings for 1 compressor, if metallic packing is used.

8. Where only one steam driven air circulating fan is fitted, the following spare gear will be required :—

1 crank shaft.

1 steam piston and rod complete.

1 steam cylinder cover for each pattern used.

1 set of connecting rod top and bottom end, and main bearing bushes, and bolts complete.

9. Where only one electrically driven air circulating fan is fitted, a spare motor complete is to be supplied.

10. Where more than one steam driven or electrically driven air circulating fan is fitted and their parts are interchangeable, only one set of spare gear will be required.

11. In cases where an independent water circulating pump is used, and its work cannot be performed by the main or the auxiliary engines, a duplicate pump complete is to be fitted.

12. In cases where an independent water circulating pump is used, and its work can be performed by the main or the auxiliary engines, a spare pump bucket and rod, and a half set of valves for the water end will be required.

13. In cases where an independent surface condenser with air, water circulating and feed pumps combined is fitted, and its work cannot be performed by the main engines, or, if the air, water circulating and feed pumps are not in duplicate, the following spare gear will be required :—

1 crank shaft with eccentric sheaves complete.

1 piston and rod complete for each pattern used.

1 eccentric strap and rod complete for each pattern used.

1 slide valve and spindle complete for each pattern used.

1 pump bucket and rod complete for each pattern used.

1 set of connecting rod and piston rod bolts and nuts.

1 set of valves for air, water circulating, and feed pumps.

6 condenser tubes and 12 ferrules.

14. In cases where an independent surface condenser with air, water circulating, and feed pumps combined, is fitted, and its work can be performed by the main engines, the following spare gear will be required :—

1 pump bucket and rod complete for each pattern used.

1 set of connecting rod and piston rod bolts and nuts.

Half set of valves for air, water circulating and feed pumps.

6 condenser tubes and 12 ferrules.

15. Where the motive power of the refrigerating machines is other than a steam reciprocating engine, the required spare gear for the motor or motors will be specially considered.

PERIODICAL SURVEYS.

Section 5. 1. A complete Survey as detailed in clause 8 is to be held every six months.

2. In the cases of vessels engaged on voyages of three months' duration, or less, a modified survey as detailed in clause 9 is to be held in about three months' time after the date of the complete periodical survey.

3. A loading port survey, as detailed in clause 10, is to be held every voyage in the case of vessels engaged on voyages of more than two months' duration, but where the voyages are of shorter duration, this survey need only be held at intervals of two months.

In the case of vessels of less than 40,000 cubic feet capacity engaged on voyages of only a few days' duration, the modified survey required in **clause 2** would be accepted in lieu of the above mentioned loading port survey.

4. Where any essential repairs or renewals are effected to the refrigerating machinery or insulation, these must be carried out under the inspection, and to the satisfaction, of the Society's Surveyors. Repairs and renewals effected at ports where there is no Surveyor to this Society must be surveyed by one of the Society's Surveyors at the earliest opportunity.

5. Where, in any case, only part of the requisite examination is held, the certificate will be endorsed with the statement of what is required to complete the survey.

6. The date following the record Lloyd's R.M.C. (*in red*) indicates the date of the last complete periodical survey of the refrigerating machinery and appliances, as detailed in **clause 8**.

7. When the periodical surveys provided for in **clauses 1, 2** and **3** are not held, the record Lloyd's R.M.C. will be expunged.

8. **Complete Periodical Survey.**—The complete periodical survey required in **clause 1** will consist of the following :—

(*a*) The machinery is to be examined under working conditions, and, according to the system of refrigeration employed, the following data are to be noted :—

The temperature of the air at the snow box and of the return air, or of the delivery and return air at the direct expansion or brine cooled batteries, or of the outflow and return cooling brine ; the temperatures of the refrigerated chambers, atmosphere, cooling water inlet and discharge, and of the gas in the condensers and evaporators, also the density of the brine. It is recommended that the examination of the machinery under working conditions should be made upon the vessel's arrival at the port of discharge, before the cargo is fully discharged.

(*b*) The steam pipes, water pipes and connections, the crank shaft and bearings, the connecting rods, the steam and air cylinders and their pistons and valves, the compressors and pistons and their piston rods, gland and neck bushes and valves, the steam condenser water and steam sides, the air cooler water and air sides, the gas condenser coils and the evaporator coils or direct expansion battery piping and the water and brine sides of their respective shells or tanks as far as practicable, the working parts of the water and brine circulating pumps, of the air and feed pumps and of the fan engines are to be examined.

(*c*) The refrigerating liquid pipes, separators and receivers, and the gas return pipes are to be examined externally as far as practicable.

(*d*) Where wrought iron or steel piping is employed for the gas condenser coils, these coils are to be drawn for examination and testing at intervals of about four years.

(*e*) Where the refrigerating machinery and its auxiliaries are electrically driven, the shafts and bearings of the motors and reduction gear, the reduction gear teeth, the commutator and brush fittings, the motor control gear, and the working parts of the lubricating oil pumps are to be examined.

(*f*) Where auxiliary machinery is fitted, the working parts of the same are to be examined.

(*g*) The spare gear is to be examined.

(*h*) In dry air machines, special attention is to be given to the condition of the air compressor and expansion cylinders, their pistons and valves. In other machines, special attention is to be given to the condition of the compressors, including their pistons and valves, rods, and gland and neck bushes.

(*i*) The brine pipes and brine return tanks, and the direct expansion cooling pipes and their connections, where fitted, are to be carefully examined as far as practicable.

(*j*) Where the brine may escape to the bilges, the cement in way of the latter is to be examined.

(*k*) The insulation throughout the cargo chambers is to be carefully examined. Where charcoal, silicate cotton, granulated cork or similar media are employed for insulating purposes, the insulation is to be carefully examined for fullness and dryness by boring where necessary. The test holes are to be efficiently closed. Special attention is to be paid to the insulation under the snow boxes, trunks and hatches where dampness may accumulate, to the sides under stringers and under decks, and to the tunnel tops. All bilge hatches are to be removed, the bilges cleared and the suction pipes, suction roses and sounding pipes are to be examined. Hatches, air trunkways and thermometer tubes, with their connections and fastenings, are to be examined, and where trunkways pass through watertight bulkheads the watertight doors are to be examined and worked.

(*l*) The air trunkways are to be made as airtight as practicable, and their fastenings secure.

(*m*) Where brine pipes are fitted, these should be examined under frosted conditions where practicable.

(*n*) Where direct expansion pipes are fitted, these are to be examined whilst under the full working conditions.

(*o*) Sea injection valves are to be opened and examined whenever the vessel is in dry dock.

9. **Modified Survey.** —The modified survey required in clause 2 will consist of the following :—

(*a*) Provided the machinery when tested under working conditions is found to be satisfactory, the following parts only will be required to be examined, viz. :—

Air and other compressors and their valves.
Expansion cylinders and valves in dry air machines.
The spare gear.

(*b*) The insulation to be examined generally, and tested if necessary.

(*c*) The air trunkways to be examined.

(*d*) Where brine pipes are fitted, these should be examined under frosted conditions where practicable.

(*e*) Where direct expansion pipes are fitted, these are to be examined whilst under the full working conditions.

10. **Loading Port Survey.**—(*a*) If the machinery and insulation have been surveyed and passed at a home port, the further survey required at a loading port will consist of an inspection to ascertain that the cargo battens are in good order and that no damage has been sustained to the insulation prior to the loading of the refrigerated cargo, and also of a test of the refrigerating machinery under working conditions, the temperatures in the chambers being noted.

(*b*) If the vessel loads at more than one port, one survey only at a loading port will be required, provided it includes the examination of all insulated chambers.

(*c*) If there is not a Surveyor to the Society available at the loading ports, or if there is not one obtainable from a port within a reasonable distance, this survey may be held at a port where the outward cargo is discharged; or the Committee will accept the report of a survey held at the loading port by a Surveyor appointed by Lloyd's Agent; or (in any case where there is no Lloyd's Agent) the report of a survey held by a reliable Surveyor, if available; or (if no such Surveyor is available) a report signed by two competent Engineers of the vessel.

Section 6. Fees.—The following are the charges that will be made for carrying out the foregoing examinations in the United Kingdom in the cases of classed vessels :—

FOR INSTALLATIONS—C.F. TOTAL CAPACITY.	During Construction.			Subsequent Complete Periodical Surveys.			Subsequent Modified Surveys.		
	£	s.	d.	£	s.	d.	£	s.	d.
Under 40,000	6	0	0	3	0	0	2	5	0
40,000 and under 80,000	9	0	0	5	0	0	3	15	0
80,000 „ 120,000	12	0	0	6	0	0	4	10	0
120,000 „ 180,000 in not more than 6 compartments	15	0	0	8	0	0	6	0	0
120,000 „ 180,000 in more than 6 compartments ...	18	0	0	9	0	0	6	15	0
180,000 „ 250,000 in not more than 8 compartments	21	0	0	11	0	0	8	5	0
180,000 „ 250,000 in more than 8 compartments ...	24	0	0	12	0	0	9	0	0
250,000 „ 330,000 in not more than 10 compartments	24	0	0	12	0	0	9	0	0
250,000 „ 330,000 in more than 10 compartments ...	27	0	0	14	0	0	10	10	0
330,000 „ 400,000 in not more than 12 compartments	30	0	0	15	0	0	11	5	0
330,000 „ 400,000 in more than 12 compartments ...	36	0	0	18	0	0	13	10	0
400,000 „ 500,000 in not more than 14 compartments	36	0	0	18	0	0	13	10	0
400,000 „ 500,000 in more than 14 compartments ...	42	0	0	21	0	0	15	15	0
500,000 „ 600,000 in not more than 16 compartments	42	0	0	21	0	0	15	15	0
500,000 „ 600,000 in more than 16 compartments ...	48	0	0	24	0	0	18	0	0
600,000 and above in not more than 18 compartments ...	48	0	0	24	0	0	18	0	0
600,000 „ in more than 18 compartments	54	0	0	27	0	0	20	5	0

As regards Unclassed Vessels the fees for the first survey of Refrigerating Machinery and Appliances will be double the amounts in column No. 1. Fees for subsequent surveys will be charged in accordance with columns Nos. 2 and 3 as printed.

By order of the Committee,

ANDREW SCOTT,
Secretary.

71, FENCHURCH STREET, LONDON, E.C.3.

12*th December*, 1929.

RULES FOR QUALITY AND TESTING OF MATERIALS.

QUALITY AND TESTING OF SHIP STEEL AND BOILER MATERIAL.

Steel Plates, Bars and Angles.

Section 1. 1. **General Regulations.** — The steel used in the construction of vessels or boilers intended for vessels classed, or proposed for classification, in the Society's Register Book, is to comply with the tests described hereafter.

2. **Process of Manufacture.**—The steel is to be made by the Open Hearth process, Acid or Basic.

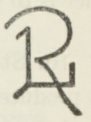
3. **Freedom from Defects.**—The finished material is to be free from cracks, surface flaws, and lamination. It is also to have a workmanlike finish, and must not have been hammer-dressed.

4. **Testing and Inspection.**—(*a*) The prescribed tests and inspections are to be made at the place of manufacture prior to despatch ; but, in the event of any of the material proving unsatisfactory in the course of being worked into vessels or into boilers, such material shall be rejected, notwithstanding any previous certificate of satisfactory testing, and such further tests of the material from the same charge may be made as the Surveyor may consider desirable.

(*b*) All test pieces are to be selected by the Surveyor and tested in his presence, and he is to satisfy himself that the prescribed conditions are fulfilled.

5. **Additional Tests before Rejection.**—(*a*) Where any of the test pieces first selected by the Surveyor do not fulfil the test requirements, two further tests of the same kind may be made from the same plate or bar, but where either of these fail, the plate or bar from which the test pieces were cut is to be rejected. In all such cases further tests are to be made before any material from the same charge can be accepted.

(*b*) Where a tensile test piece breaks outside the middle half of its gauge length, and the elongation is less than that required by the Rules, the test may, at the Maker's option, be discarded and another test be made of the same plate or bar.

6. **Branding.**—(*a*) Every plate and bar is to be clearly and distinctly marked by the Maker in two places with the Society's brand, thus :—  indicating that the material has complied with the Society's tests.

(*b*) Plates or bars bearing this brand are not to be forwarded from the Steel Works until the prescribed tests have been made by the Surveyor, and the mill sheets have been signed by him. All plates and bars are also to be legibly stamped in two places with the Maker's name or trade mark, and the place where made. They are also to be stamped with numbers or identification marks by which they can be traced to the charge from which the material was made.

7. **Defacing of Rejected Material.**—In the event of the material failing, in any case, to withstand the prescribed tests, the Surveyor is to see that the Society's brand stamped on the plates and bars by the Maker has been defaced by punch marks extending beyond the brand in the form of a cross, thus :— denoting that the material has been rejected.

8. **Maker's Certificate.**—Before the mill sheets are signed by the Surveyor, the Maker is required to furnish him with a certificate guaranteeing that the material has been made by the Open Hearth process, and that it has been subjected to, and has withstood satisfactorily, the required tests in the presence of the Surveyor. The following form of certificate will be accepted if printed on each mill sheet with the name of the firm, and initialled by the Test House Manager :—

> "We hereby certify that the material described below has been made by the Open Hearth process, and is that which has been satisfactorily tested in the presence of the Surveyor in accordance with the Rules of Lloyd's Register."

9. **Facilities for Inspection.**—The Maker is to adopt a system of marking the ingots, billets, slabs, plates, bars, and other material which will enable all finished material to be traced to the original charge, and the Surveyor must be given every facility for tracing all plates and bars to their

respective charges, and for witnessing the required tests. When the Surveyor is satisfied with the material and with the results of the tests, he is to be furnished with two copies of the advice notes of the material for his signature, one of which is to be forwarded by the Manufacturer to the Shipbuilder or Boiler Maker, and the other is to be forwarded by the Surveyor to the Surveyors at the port where the vessel or boiler is to be built.

10. **Steel not produced where Rolled.**—Where steel is not produced in the works at which it is rolled, a certificate is to be supplied to the Surveyor, stating the Open Hearth process by which it was made, the name of the Steel Maker who supplied it, also the numbers of the charges for reference to the books of the Steel Maker. The number of the charge is to be marked on each ingot or billet for the purpose of identification, and the finished plates and bars are also to be legibly stamped in two places with the Maker's name or trade mark, and the place where made. They are also to be stamped with numbers or identification marks by which they can be traced to the charge from which the material was made.

11. **General.**—In addition to the tests described hereafter the material may be subjected to further tests at the discretion of the Surveyors.

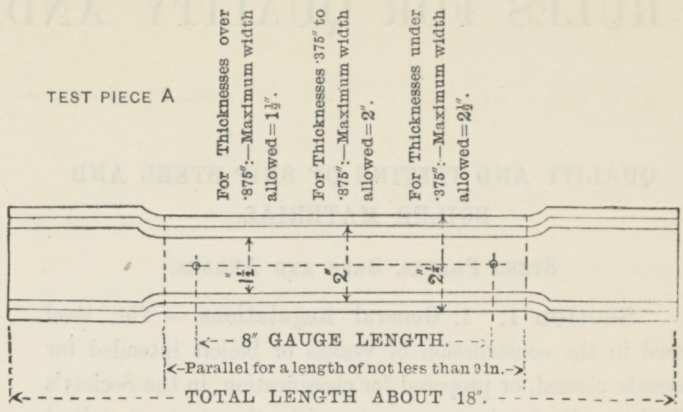
12. **Steel of other Tenacity.**—When desired by Owners and Builders, consideration will be given by the Committee to proposals for the use of steel of other tenacity than is provided for in the Rules.

STANDARD TEST PIECES.

Section 2. 1. **Tensile Test Pieces.**—The tensile strength and ductility are to be determined from Standard test pieces cut lengthwise or crosswise from the rolled material. Where material is annealed or otherwise treated before despatch, the test pieces are to be similarly and simultaneously treated with the material before testing.

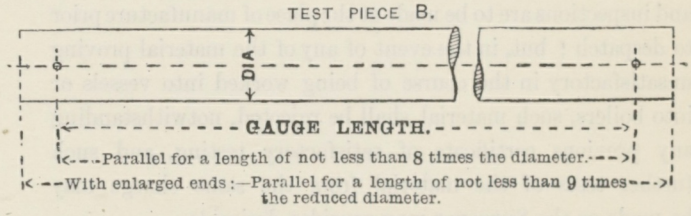
2. **Plates.**—(*a*) Wherever practicable the rolled surfaces are to be retained on two opposite sides of the test piece. The elongation is to be measured on a Standard test piece having a gauge length of 8 inches.

(*b*) For material more than ·875 inch in thickness the width of the test piece between the gauge points is not to exceed $1\frac{1}{2}$ inches; for material ·875 inch to ·375 inch in thickness, inclusive, the width is not to exceed 2 inches; for material less than ·375 inch in thickness the width is not to be more than $2\frac{1}{2}$ inches. In other respects the test pieces are to conform generally to the Standard test piece A.

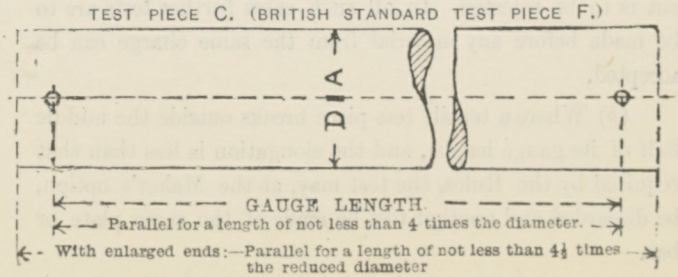


3. **Round Bars.**—(*a*) Bars may be tested full size as rolled, or they may be turned down to a convenient size, and if tested one inch in diameter, or under, the test piece is to have a gauge length of 8 times the diameter. Where enlarged ends are used the length of the parallel portion is not to be less than 9 times the reduced diameter of the test piece (see Standard test piece B).

The sectional area of the test piece is not to be less than $\frac{1}{4}$ square inch.



(*b*) Where bars are above one inch diameter, and are tested full size as rolled, or have been turned down and the resulting test piece is above one inch diameter, a gauge length of 4 times the diameter may be used if preferred by the Manufacturer, in which case an increased elongation will be required, as specified in **Sections 5** and **6**. Where enlarged ends are used, the length of the parallel portion is not to be less than $4\frac{1}{2}$ times the reduced diameter (see Standard test piece C).



4. **Straightening of Test Pieces.**—Any straightening of test pieces A, B and C which may be required is to be done cold.

BEND TEST PIECES AND TESTS FOR SHIP AND BOILER STEEL.

Section 3. 1. **Number of Bend Tests for Ship Steel.**—A cold or temper bend test is to be taken from each plate or bar as rolled, and these tests are to be in about equal numbers from each charge; but a cold bend test is to be taken from all plates specially marked for cold flanging.

2. **Number of Bend Tests for Boiler Steel.** (*a*) **Plates.**—A cold or temper bend test piece is to be taken from each plate as rolled. For plates exceeding $2\frac{1}{2}$ tons in weight one bend test piece is to be taken from each end.

The bend tests from shell plates, butt straps and other plates which have not to be flanged or worked in the fire or which when in use are not to be exposed to flame, are to be cold bend tests. The bend tests from plates which have to be flanged or worked in the fire or which when in use will be exposed to flame are to be temper bend tests. In the cases of shell plates permitted to have a tensile strength above 34 tons per square inch one temper bend is to be made in addition to the cold bends above specified in the case of each plate which is above 34 tons per square inch.

(*b*) **Angle Bars.**—A cold or a temper bend test is to be taken from each angle bar rolled.

(*c*) **Stay Bars.**—A cold and a temper bend test are to be taken from every 15 stay bars as rolled from each charge.

3. **Cold and Temper Bend Test Pieces.**—(*a*) Test pieces are to be sheared lengthwise or crosswise from plates or bars, and are not to be less than $1\frac{1}{2}$ inches wide, but for small bars the whole section may be used. For rivet bars bend tests are not required.

(*b*) In all cold bend tests, and in temper bend tests on test pieces ·5 inch in thickness and above, the rough edge or arris caused by shearing may be removed by filing or grinding, and test pieces one inch in thickness and above may have the edges machined, but the test pieces are to receive no other preparation. The test pieces are not to be annealed unless the material from which they are cut is similarly annealed, in which case the test pieces are to be similarly and simultaneously treated with the material before testing.

(*c*) For small sectional material these bend tests may be made from the flattened bar.

4. **Bend Tests.**—(*a*) For temper bend tests the test pieces are to be heated to a blood red and quenched in water at a temperature not exceeding 80 degrees Fahr. The colour is to be judged indoors in the shade.

(*b*) For both cold and temper bends the test piece is to withstand, without fracture, being doubled over until the internal radius is equal to $1\frac{1}{2}$ times the thickness of the test piece, and the sides are parallel.

(*c*) Bend tests may be made either by pressure or by blows.

TESTS FOR MANUFACTURED RIVETS.

Section 4. 1. **Tests.**—Rivets selected by the Surveyor from the bulk are to withstand the tests described hereafter.

(*a*) The rivet shanks are to be bent cold, and hammered until the two parts of the shank touch in the manner shown in Fig. 1, without fracture on the outside of the bend.

(*b*) The rivet heads are to be flattened, while hot, in the manner shown in Fig. 2, without cracking at the edges. The heads are to be flattened until their diameter is $2\frac{1}{2}$ times the diameter of the shank.

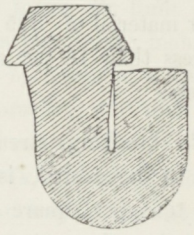


FIG. 1.

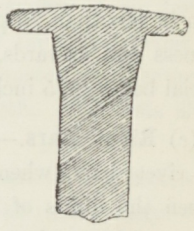


FIG. 2.

TESTS FOR SHIP STEEL.

Section 5. 1. **Number of Tensile Tests.** (*a*) **Plates and Sectional Material.**—When the Surveyor is in constant attendance at the Steel Works one tensile test piece for plates or sectional material is to be taken from the finished material of each charge.

Where the quantity of the material from one charge exceeds 25 tons, a second tensile test will be required; also additional tests are to be made for every variation in thickness of ·15 of an inch in the plates or sectional bars from each charge.

(*b*) **Rivet Bars.**—Where required to be tested, one tensile test piece is to be taken from each charge used for rivet bars; but where the weight of the bars, as rolled, from one charge exceeds 10 tons, an additional tensile test is to be made for each further 10 tons or portion thereof.

2. **Tensile Tests.** (*a*) **Plates.**—The tensile breaking strength of steel plates, determined from Standard test pieces, is to be between the limits of 26 and 32 tons per square inch. For plates specially intended for cold flanging and marked for identification, the tensile strength is to be between the limits of 26 and 30 tons per square inch. In the case of material for purposes in which tensile strength is not important, the tensile test may be dispensed with and the bend test only be made, if so specified by the builders and approved by the Committee. The elongation, measured on a Standard test piece having a gauge length of 8 inches, is not to be less than 20 per cent. for material of ·375 inch in thickness and upwards, and not less than 16 per cent. for material below ·375 inch in thickness.

(*b*) **Angles, Bulb Angles, Channels, and Similar Sections.**—The tensile breaking strength of angles, bulb angles, channels, and similar sectional material is to be between the limits of 26 and 32 tons per square inch. In the case of material for purposes in which tensile strength is not important, the tensile test may be dispensed with and the bend test only be made, if so specified by the builders and approved by the Committee. The elongation measured on a Standard test piece having a gauge length of 8 inches is not to be less than 20 per cent. for material of ·375 inch in thickness and upwards, and not less than 16 per cent. for material below ·375 inch in thickness.

(*c*) **Rivet Bars.**—The tensile breaking strength of steel rivet bars, when required to be tested, is to be between the limits of 25 and 30 tons per square inch of section, with an elongation of not less than 25 per cent. of the gauge length of eight times the diameter of the test piece, measured on the Standard test piece B, or 30 per cent. measured on the Standard test piece C. The bars may be tested the full size as rolled.

3. **Occasional Attendance at Steel Works (Steel for Shipbuilding Purposes).**—(*a*) When the Society's Surveyor is not in constant attendance at the Steel works, the Makers themselves may, with the written authority of the Society, comply with all the prescribed requirements, and furnish the Surveyor with a certificate to the effect that the Society's Rules as to the testing of steel have been complied with in the case of the material submitted for approval. The Surveyor is then to make check tensile, cold, and temper bend tests from not less than one plate or bar in every batch of 50 or less in number, provided the batch be all from one charge. Where more than one charge is represented, each charge is to be tested. Additional tests are also to be made for every variation in thickness of ·15 of an inch made from one charge. The test pieces are to be selected by the Surveyor from the plates or bars, and not from shearings previously detached from them, and when marked by the Surveyor for testing they are to be followed, as far as practicable, through the different stages of preparation until the tests are completed.

(*b*) Where the tests are unsatisfactory, the whole of the material from the charge is to be rejected, and the Surveyor is to see that the Society's brand is satisfactorily defaced.

TESTS FOR BOILER STEEL.

Section 6. 1. **Number of Tensile Tests.** (*a*) **Plates.**—One tensile test piece is to be taken from each plate as rolled. For plates exceeding $2\frac{1}{2}$ tons in weight one tensile test piece is to be taken from each end.

(*b*) **Angle, Tee, Rivet and Stay Bars.**—One tensile test is to be made from each 15 or part of 15 bars rolled of each section or diameter from the same charge, but not less than two tensile tests are to be made unless the total number of bars rolled from the same charge is 8 or less than 8 and the bars are of the same section or diameter, in which case one tensile test will suffice. For round bars of $1\frac{3}{4}$ inch diameter and under, the numbers 50 and 20 are to be substituted for 15 and 8 respectively for determining the number of tests required.

2. **Tensile Tests.** (*a*) **Plates.**—The tensile breaking strength of steel plates for shells and girders, determined from Standard test pieces, is to be between the limits of 28 and 35 tons per square inch, but a range of more than 4 tons per square inch will not be permitted in any one case. For plates intended for flanging or welding, and for combustion chambers and furnaces, the tensile breaking strength is to be between the limits of 26 and 30 tons per square inch. The elongation, measured on a Standard test piece having a gauge length of 8 inches, is not to be less than 20 per cent. for material of ·375 inch in thickness and upwards required to have a tensile breaking strength between the limits of 28 and 35 tons per square inch; and not less than 23 per cent. for material of ·375 inch in thickness and upwards required to have a tensile breaking strength between the limits of 26 and 30 tons per square inch.

(*b*) **Angle and Tee Bars.**—The tensile breaking strength of angle and tee bars is to be between the limits

of 28 and 32 tons per square inch, with an elongation of not less than 20 per cent. measured on the Standard test piece A.

For plates, angles, or tee bars under ·375 inch in thickness the elongation may be 3 per cent., but not more than 3 per cent., below the prescribed elongations.

Wherever practicable the rolled surfaces are to be retained on two opposite sides of the test pieces.

(*c*) **Stay Bars.**—The tensile breaking strength of longitudinal stay bars is to be between the limits of 28 and 35 tons per square inch, with an elongation of not less than 20 per cent. measured on the Standard test piece B, or 24 per cent. measured on the Standard test piece C; but a range of not more than 4 tons per square inch shall be permitted in any one case. For steel bars for combustion chamber stays the tensile breaking strength is to be between the limits of 26 and 30 tons per square inch, with an elongation of not less than 23 per cent. measured on the Standard test piece B, or 28 per cent. measured on the Standard test piece C.

(*d*) **Rivet Bars.**—The tensile breaking strength of rivet bars is to be between the limits of 26 and 30 tons per square inch of section, with an elongation of not less than 25 per cent. measured on the Standard test piece B or 30 per cent. measured on the Standard test piece C. The bars may be tested the full size as rolled.

(*e*) **Special Quality Steel for Boilers.**—When steel material is proposed having other tensile strength than that specified in this section, the proposed limits of tensile strength and elongation should be submitted for consideration.

SPECIAL QUALITY STEEL FOR SHIPBUILDING.

Regulations for Testing.

Section 7. 1. **Process of Manufacture.**—The steel is to be made by the Open Hearth Process, Acid or Basic, at works recognised by the Committee.

2. **Freedom from Defects.**—The finished material is to be free from cracks, surface flaws and laminations. It is also to have a workmanlike finish, and must not be hammer dressed.

3. **Testing and Inspection.**—The prescribed tests and inspections are to be made at the place of manufacture from the plates or bars in the condition in which they will be despatched; in the event of any of the material proving unsatisfactory in the course of being worked into the vessels, such material shall be rejected, notwithstanding any previous certificate of satisfactory testing, and such further tests of the material from the same charge may be made as the Surveyor may consider desirable.

All test pieces are to be selected by the Surveyor and tested in his presence, and he is to satisfy himself that the prescribed conditions are fulfilled.

4. **Tensile test pieces.**—The tensile strength, ductility and limit of proportionality (as defined below) are to be determined from standard test pieces cut lengthways from the bar, and 50 per cent. lengthways and 50 per cent. crossways from the plate.

Where material is annealed or otherwise treated before despatch, the test pieces are not to be cut off until the annealing or treating process has been completed.

5. **Standard test pieces.**—The test pieces are all to be of standard form as described in Section 2 of the Society's Rules for the Quality and Testing of materials.

6. **Tensile Strength.**—The tensile breaking strength is not to exceed 38 tons per square inch, with a range of not more than 5 tons per square inch in any one case; the elongation is to be not less than 20 per cent. measured on a gauge length of 8 inches.

7. **Limit of Proportionality.**—The material must satisfy a test for limit of proportionality of not less than 15 tons per square inch, the elastic properties being determined by means of a Ewing extensometer, or other approved extensometer, of 8 inch gauge length. The tests shall be carried out as follows:—

(*a*) A load of 2 tons per square inch of section shall be applied to the test piece and an extensometer reading taken.

(*b*) The load shall be increased to 15 tons per square inch of section and a second reading taken.

(*c*) The load shall be reduced to 2 tons per square inch and a third reading taken.

(*d*) The third reading shall not exceed the first reading by more than ·0004 inches.

8. **Number of test pieces.**—One tensile test piece is to be made from at least every fifth plate or bar, as rolled, from each charge. This test piece is to be used for determining both the limit of proportionality and the tensile strength. The Surveyor should select a sample from each variation of thickness of ·10 of an inch in the plates or bars from each charge.

9. **Cold bend tests.**—A cold bend test is to be taken both lengthways and crossways from every plate (bars lengthways only). The test pieces are to withstand without fracture, being doubled over until the internal radius is equal

to one and a half times the thickness of the test pieces and the sides are parallel.

10. **Preparation of test pieces.**—The test pieces are to be carefully prepared in the usual manner.

11. **Additional tests before rejection.**—Where any of the test pieces first selected by the Surveyor do not fulfil the above requirements, two further tests of the same kind may be made from the same plate or bar, but where either of these fail the plate or bar from which the test pieces were cut is to be rejected.

In addition to the tests described above, the material may be subjected to further tests at the discretion of the Surveyor.

12. **Branding.**—In addition to the Manufacturer's name or Trade Mark and the place where made, and the numbers and identification marks laid down by the Society's Rules, each plate or bar is to be distinctly branded in two places with the Society's brand LR. and, in addition, with letters SPL, thus:—LR. SPL. in one stamp.

13. **Defacing of material.**—In the event of the material failing, the brand is to be defaced in the usual manner.

14. **Submission of plans.**—When it is desired to use this material in the construction of vessels intended to be classed in the Society's Register Book, plans showing the reduction of scantlings proposed should be submitted for the consideration of the Committee.

15. **Alternative proposals.**—The Committee will consider proposals for the use of special quality steel having limits different from those prescribed above, provided full particulars as to the properties and manufacture of the material are submitted for consideration.

SPECIAL IRON FOR SCREW STAYS FOR COMBUSTION CHAMBERS.

Section 8. General.—In order that iron screw stays may be approved of the same size as would be required for mild steel the iron must withstand the tests described hereafter.

1. **Number of Tensile Tests.**—The bars as rolled are to be placed in batches of 20, and one tensile test piece is to be taken from each batch. If this is unsatisfactory, two other bars are to be selected for test, but should either of these fail the batch is to be rejected.

2. **Tensile Test.**—The tensile breaking strength is not to be less than 21½ tons per square inch, with an elongation of not less than 25 per cent. measured on the Standard test piece B, or of 30 per cent. measured on the Standard test piece C.

3. **Bend Tests.**—(*a*) Test pieces, either of the bar as rolled or turned down to one inch diameter, are to stand bending cold until the sides are parallel and the space between the two sides is not greater than the diameter of the test piece.

(*b*) One ordinary bend test piece is to be taken from each batch, and a similar test piece from each batch is to be lightly and evenly nicked on one side with a sharp cutting tool and bent back at this point through an angle of 180° by pressure or by a succession of light blows. The fracture must be clean, fibrous, free from slag or dirt or any coarse crystalline structure. If either of these tests is unsatisfactory, two other bars are to be selected for test, but should either of these fail the batch is to be rejected.

QUALITY AND TESTING OF STEEL CASTINGS.

Section 9. 1. **Process of Manufacture.**—Steel for castings is to be made by the Open Hearth process, Acid or Basic, or by such other process as may be approved by the Committee.

2. **Annealing.**—All steel castings are to be thoroughly annealed in a properly constructed annealing furnace, which must permit of the whole casting being uniformly raised in temperature throughout its whole extent to the necessary intensity required for annealing purposes. The casting is to be allowed to cool down prior to removal from the annealing furnace; and if subsequently heated for any purpose it is again to be similarly annealed if required by the Surveyor.

3. **Testing and Inspection.**—(*a*) The tests and inspections hereafter described are to be made, preferably at the place of manufacture prior to despatch, but in the event of any casting proving unsatisfactory in the course of preparation or erection, such casting is to be rejected notwithstanding any previous certificate of satisfactory testing.

(*b*) The tensile strength and ductility are to be determined from standard test pieces, which are to be prepared from pieces cast on the casting. These pieces are not to be cut or partially cut from the castings until the annealing of such castings has been completed, nor until they have been stamped by the Surveyor. The test pieces are to be stamped by the Surveyor after the annealing. All test pieces are to be selected by the Surveyor and tested in his presence, and he is to satisfy himself that the conditions herein described are fulfilled.

(*c*) Where the castings are to be used for purposes for which cast iron is ordinarily employed they need not be

submitted to tensile and bend tests, but they are to be submitted to the drop and hammering tests specified in **clauses 10** and **12.**

4. **Number of Tests.**—At least one tensile test and one cold bend test are to be taken from each casting. In castings of complex design, referred to in **clause 11,** at least two tensile and two cold bend tests are to be taken. Where a casting is made from more than one charge of steel, at least four tensile and four cold bend tests are to be taken from pieces cast as far apart as possible on the casting, some test pieces being taken from as near the top, and others from as near the bottom of the casting as practicable.

5. **Dimensions of Tensile Test Pieces.**—The tensile test pieces are to be turned so as to have a diameter of ·564 inch with a gauge length of 2 inches, or a diameter of ·798 inch with a gauge length of 3 inches, or a diameter of ·977 inch with a gauge length of $3\frac{1}{2}$ inches.

6. **Tensile Tests.**—The tensile breaking strength determined from test pieces of Standard dimensions is to be between the limits of 26 and 35 tons per square inch with an elongation of not less than 20 per cent. measured on the Standard test piece.

7. **Dimensions of Bend Test Pieces.**—The bend test pieces are to be machined to a rectangular section one inch wide by $\frac{3}{4}$ inch thick, with the edges rounded to a radius of $\frac{1}{16}$th of an inch. They are to be bent over the thinner section. The bending may be performed either by pressure or by blows.

8. **Bend Tests.**—The bend test pieces are to withstand, without fracture, being bent cold through an angle of 120 degrees, the internal radius of the bend being not greater than one inch.

9. **Additional Tests before Rejection.**—Where either the tensile or bend test or both fail, and the Surveyor considers the fractured test piece or test pieces, or the results obtained therefrom, do not fairly represent the quality of the casting, duplicates of the test or tests which failed are to be made if requested by the Maker. In such cases the quality of the casting is to be judged by the result of the duplicate test or tests and not by the original test or tests which failed.

10. **Percussive Tests.**—Stern frames cast in one piece are to be let fall on hard ground (excavations being made to take bosses and other projections) after being raised through an angle of 45 degrees. Stern frames cast in more than one piece, rudders, steering quadrants, crossheads, tillers and machinery castings, are to be dropped on hard ground from a height of from 7 to 10 feet according to the design, shape, and weight of the casting.

11. **Castings of Complex Design.**—Castings of complex design which would be liable to be deformed if submitted to the drop or percussive test, may have this test dispensed with provided two tensile and two cold bend tests are made upon pieces taken from positions as far apart as possible on each casting; one tensile and one bend test being taken from as near the top and the others from as near the bottom of the casting as practicable.

12. **Hammering Tests.**—After being subjected to the percussive test, the casting in each case is to be subsequently slung up and well hammered with a sledge hammer not less in weight than 7 lbs., to satisfy the Surveyors that the casting is sound and without flaw. This hammering test is also to be applied to castings of complex design which may not have been submitted to a percussive test.

13. **Drilling Tests.**—In the case of large steel castings for shipbuilding purposes, the Surveyors are to supplement the foregoing tests by drilling small holes at such parts of the castings where experience shows that cavities and contraction cracks are most likely to occur, and at positions which are to be agreed upon between the Surveyor and the Manufacturer, in order to determine the soundness or otherwise of the casting. These holes are afterwards to be tapped and properly filled up with screw plugs.

14. **Branding.**—Every casting after it has withstood satisfactorily the prescribed tests, is to be clearly and distinctly marked by the Society's Surveyor indicating that the casting has complied with the Society's requirements.

QUALITY AND TESTING OF INGOT STEEL FORGINGS.

Section 10. 1. **Process of Manufacture.**—(*a*) Ingot steel for forgings is to be made by the Open Hearth process, Acid or Basic, or by such other process as may be approved by the Committee.

(*b*) The forgings are to be sound; they are to be made from sound ingots, and for all important forgings such as stern frames, rudder heads and main pieces of rudders upon which arms are shrunk, crank and other shafts connecting

rods and piston rods, the forgings are to be gradually and uniformly forged. The sectional area of the body of the forging (as forged) is not to exceed one-fifth of the sectional area of the original ingot, and no part of the forging (as forged) is to have more than two-thirds of the sectional area of the original ingot.

2. **Annealing.**—All important ingot steel forgings are to be thoroughly annealed in a properly constructed annealing furnace, which must permit of the whole forging being uniformly raised in temperature, throughout its whole extent, to the necessary intensity required for annealing purposes. If the forging be subsequently heated for any further forging it is again to be similarly annealed, if required by the Surveyor.

3. **Testing and Inspection.**—(*a*) The tests and inspections hereafter described are to be made, preferably at the place of manufacture prior to despatch, but in the event of any forging proving unsatisfactory in the course of preparation or erection, such forging is to be rejected notwithstanding any previous certificate of satisfactory testing.

(*b*) The tensile strength and ductility are to be determined from Standard test pieces which are to be prepared from sample pieces cut lengthwise from the forging from a part of not less sectional dimensions than the body of the forging. Such Standard test pieces are to be machined from the sample pieces without forging down, and the sample pieces are not to be detached from the forging until the annealing of such forging has been completed. The test pieces are to be stamped by the Surveyor after the annealing. All test pieces are to be selected by the Surveyor and tested in his presence, and he is to satisfy himself that the conditions herein described are fulfilled.

4. **Number of Tests.**—At least one tensile and one cold bend test piece are to be taken from each forging. Where a number of articles are cut from one forging, one tensile and one cold bend test from this whole forging will be sufficient.

5. **Dimensions of Tensile Test Pieces.**—The tensile test pieces are to be turned so as to have a diameter of ·564 inch with a gauge length of 2 inches, or a diameter of ·798 inch with a gauge length of 3 inches, or a diameter of ·977 inch with a gauge length of $3\frac{1}{2}$ inches.

6. **Tensile Tests.**—(*a*) The tensile breaking strength determined from test pieces of Standard dimensions is to be between the limits of 28 and 32 tons per square inch with an elongation on the Standard test piece of not less than 29 per cent. for 28 ton steel, and 25 per cent. for 32 ton steel, and in no case is the sum of the tensile breaking strength and corresponding elongation to be less than 57.

(*b*) Stern posts, propeller posts, rudders, and other ship forgings which are to be welded may be made of specially soft Open Hearth Ingot Steel instead of wrought iron, such steel to have a tensile breaking strength between the limits of 22 and 26 tons per square inch, with an elongation on the standard test piece (**Sec. 10, clause 5**) of not less than 35 per cent. for 22 ton steel and 31 per cent. for 26 ton steel; in no case is the sum of the tensile breaking strength and corresponding elongation to be less than 57. The remaining tests and requirements are to be as prescribed for ordinary ingot steel.

7. **Dimensions of Bend Test Pieces.**—The bend test pieces are to be machined to a rectangular section one inch wide by $\frac{3}{4}$ inch thick, with the edges rounded to a radius of $\frac{1}{16}$th of an inch. They are to be bent over the thinner section. The bending may be performed either by pressure or by blows.

8. **Bend Tests.**—The bend test pieces are to withstand without fracture being bent cold through an angle of 180 degrees, the internal radius of the bend being not greater than $\frac{1}{4}$ inch.

9. **Additional Tests before Rejection.**—Where either the tensile or bend test, or both, fail, and the Surveyor considers the fractured test piece or test pieces, or the results obtained therefrom, do not fairly represent the quality of the forging, duplicates of the test or tests which failed are to be made if requested by the Maker. In such cases the quality of the forging is to be judged by the result of the duplicate test or tests and not by the original test or tests which failed.

10. **General.**—The requirements as to annealing and testing are intended to apply to rudder heads and main pieces of rudders upon which arms are shrunk, to shafts of all descriptions, also to connecting rods and piston rods which require to be made in several heats. They are not intended to apply to small forgings which during their last stage of manufacture are uniformly heated throughout.

11. **Branding.**—Every forging after it has withstood satisfactorily the prescribed tests, is to be clearly and distinctly marked by the Society's Surveyor indicating that the forging has complied with the Society's requirements.

QUALITY AND TESTING OF ANCHORS FOR STEAM VESSELS, SAILING VESSELS AND TUGS.

Section 11. 1. **Process of Manufacture.** — (*a*) Anchors are to be made of forged wrought iron, or forged open hearth ingot steel, or cast steel; the use of Bessemer steel is prohibited.

(*b*) Each important part of a forged anchor is to be plainly marked by the Makers with the words "Forged Wrought Iron," or "Forged Open Hearth Ingot Steel," as the case may be.

(*c*) Steel Anchor Shackles are to be forged and unwelded.

2. **Tests of Anchors.**—All anchors, including Stream and Kedge anchors weighing more than 168 lbs. inclusive of stock, are to be tested in accordance with the requirements of the following Table and the Certificates of Test produced.

WEIGHTS AND CORRESPONDING PROOF STRAINS OF ANCHORS.

Weight.	Test.	Weight.	Test.	Weight.	Test.	Weight.	Test.	Weight.	Test.	Weight.	Test.
Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.
1¼	3 13/20	7¼	9 9/20	14½	16 1/20	30	28 12/20	48¾	41 11/20	94½	65 3/20
1½	3 18/20	7½	9 13/20	15	16 10/20	30½	29	49½	42 1/20	95	65 7/20
1¾	4 4/20	7¾	9 18/20	15¼	16 14/20	31	29 7/20	51	43	98	66 10/20
2	4 10/20	8	10 2/20	16¼	17 11/20	32	30 2/20	52½	43 18/20	100	67 5/20
2¼	4 15/20	8¼	10 7/20	16¾	18	32½	30 10/20	54½	45 1/20	101½	67 16/20
2½	5	8½	10 12/20	17	18 5/20	33	30 17/20	56¼	46 3/20	104½	68 19/20
2¾	5 5/20	8¾	10 17/20	17½	18 12/20	33½	31 5/20	58	47 5/20	105½	69 6/20
3	5 10/20	9	11 2/20	18¾	19 13/20	34	31 12/20	60	48 7/20	109	70 12/20
3¼	5 14/20	9¼	11 6/20	19	19 17/20	35½	32 15/20	61½	49 3/20	109½	70 16/20
3½	5 18/20	9½	11 11/20	20½	21 3/20	36	33 2/20	63¾	50 7/20	113½	72 6/20
3¾	6 3/20	9¾	11 15/20	21	21 12/20	36½	33 8/20	65	51	118	74
4	6 7/20	10	12	21¼	21 16/20	37¼	33 18/20	68	52 12/20	122½	75 10/20
4¼	6 12/20	10¼	12 4/20	22	22 7/20	38	34 10/20	68½	52 18/20	127	76 18/20
4½	6 17/20	10½	12 8/20	22½	22 15/20	38¾	34 19/20	72	54 15/20	132	78 10/20
4¾	7 2/20	10¾	12 13/20	23¼	23 6/20	39	35 2/20	72½	55	137	80 1/20
5	7 7/20	11	12 17/20	23½	23 10/20	40	35 15/20	76	56 15/20	142	81 12/20
5¼	7 11/20	11¼	13 2/20	24½	24 6/20	40¾	36 6/20	77	57 5/20	147½	83 6/20
5½	7 16/20	11½	13 7/20	25	24 15/20	42	37 2/20	80	58 10/20	153	85
5¾	8	11¾	13 12/20	25½	25 3/20	42½	37 10/20	81¼	59 2/20	159	86 10/20
6	8 5/20	12	13 17/20	26½	26	44¼	38 15/20	83½	60 5/20		
6¼	8 10/20	12½	14 6/20	27¾	26 18/20	45	39 5/20	85½	61 5/20		
6½	8 15/20	13	14 15/20	28	27 2/20	46	39 17/20	87	61 17/20		
6¾	9	13½	15 3/20	28½	27 10/20	47¾	40 19/20	90	63 5/20		
7	9 5/20	14	15 12/20	29½	28 5/20	48	41 2/20	91	63 12/20		

The weight given in the above Table is either for stockless anchors or for the ordinary type excluding stock. For intermediate weights of anchors the tests may be obtained by interpolation.

CAST STEEL ANCHORS.

Section 12. 1. **General.**—All cast steel anchors in addition to undergoing the statutory tests are to be subjected to the percussive, hammering and bending tests given below.

These tests are to be carefully and completely made in the presence and to the satisfaction of the Society's Surveyors.

2. **Percussive Test.**—(*a*) The anchor, or where anchors are made in more than one piece, each piece is to be raised a given height and then dropped on a steel or iron slab.

For weights of 15 cwts. and below, the height is to be 15 feet, and for weights above 15 cwts. the height is to be 12 feet.

The lowest part of the anchor or piece when suspended is to be at least the given height above the iron slab upon which it is to be dropped.

(*b*) An anchor of the Admiralty pattern is first to be raised vertically to the given height with its shank and arms in a horizontal position, and then let fall from that height.

It is then to be raised a second time to the given height and suspended with the crown downwards. Two steel or iron blocks are to be placed underneath it, and the anchor is to be let fall from this position so that one of the blocks receives it on the middle of one arm, and the other block receives it on the middle of the other arm.

(*c*) The slab for the horizontal test is to be of steel or iron, well laid on a solid concrete foundation to the satisfaction of the Surveyor.

(*d*) If the slab on which the anchor falls is broken by the impact the test is to be repeated until a slab is made that does not break.

(*e*) The blocks for the vertical test are to be solid and of sufficient height to prevent the crown of the anchor from touching the slab, and are to be to the satisfaction of the Surveyor.

3. **Hammering Test.**—Provided the percussive test has been satisfactory, the anchor or piece is to be slung and thoroughly hammered over its parts with a sledge hammer weighing not less than 7 lbs., and is required to give under this treatment such a clear ring in all its parts as shall satisfy the Surveyor that the casting is sound and that no flaws have developed by the application of the preceding percussive tests.

4. **Bending Test.**—(*a*) Cast steel may be passed as sufficiently ductile for anchors when a piece of each casting, 8 inches in length, is cut from the casting, turned to one inch in diameter, and is then bent cold by hammering through an angle of 90 degrees over a radius of $1\frac{1}{2}$ inches, without showing signs of flaw or fracture.

(*b*) A piece is to be cast on each cast steel anchor or on each portion of such anchor when it is made of more than one casting, and each piece is to be of sufficient size to enable one test piece of the size stated above to be cut out of it, or it may be (at the discretion of the Manufacturer) of sufficient size to enable four test pieces to be cut out of it.

Where it is only of sufficient size to enable one test piece to be cut out of it, that piece is to be subjected to the bending test named in paragraph (*a*) above, and should it fail to withstand the test the casting is to be rejected.

Where the piece is large enough to enable four test pieces to be cut out of it, one of these is to be turned in a lathe to one inch in diameter for a length of 8 inches, and bent cold through an angle of 90° over a radius of $1\frac{1}{2}$ inches, and should the piece withstand this test without flaw or fracture it shall be deemed to have withstood a satisfactory test for ductility.

Should the one test piece not pass this test, all or any of the other three test pieces may be tested in a similar manner, and should any one of the four test pieces pass this test, the anchor, or part of the anchor, as the case may be, shall be deemed so far satisfactory.

5. **Annealing.**—Each anchor is to be properly and sufficiently annealed, and when so annealed stamped "Annealed Steel." Annealing is not to be regarded as proper, or efficient, unless the process extends from three days for small anchors up to six days for large ones.

TESTS FOR CHAIN CABLES AND STREAM CHAINS.

Section 13. 1. **Tests for Chain Cables and Stream Chains.**—(*a*) All stud link chain cables and stream chains are to be tested in accordance with the requirements of the following Table and the certificates of test produced.

Stud Link Chain Cables.

Minimum Size.	Proved to Statutory Test.	Breaking Test.	Minimum Weight per length of 15 fms.	Minimum Size.	Proved to Statutory Test.	Breaking Test.	Minimum Weight per length of 15 fms.
Ins.	Tons.	Tons.	Cwts.	Ins.	Tons.	Tons.	Cwts.
7/16	3 4/10	5 1/10	1¾	2	72	100 8/10	30
8/16	4 5/10	6¾	2⅛	2 1/16	76 5/10	107 1/10	31⅞
9/16	5⅝	8 4/10	2⅝	2 2/16	81¼	113¾	33¾
10/16	7	10 5/10	3¼	2 3/16	86⅛	120 5/10	35⅞
11/16	8 5/10	12¾	3⅝	2 4/16	91⅛	127 5/10	37⅞
12/16	10⅛	15⅛	4⅜	2 5/16	96¼	134¾	40
13/16	11⅞	17 8/10	5⅛	2 6/16	101 5/10	142 1/10	42¼
14/16	13¾	20⅝	5⅞	2 7/16	106 9/10	149⅝	44½
15/16	15 8/10	23 7/10	6¾	2 8/16	112 5/10	157 5/10	47
1	18	27	7⅝	2 9/16	116 7/10	163⅜	49½
1 1/16	20 3/10	30 4/10	8⅝	2 10/16	120 9/10	169¼	52
1 2/16	22¾	34⅛	9¾	2 11/16	125 1/10	175⅛	54½
1 3/16	25⅜	38	10⅞	2 12/16	129 3/10	181	57⅛
1 4/16	28⅛	42⅛	12	2 13/16	133 4/10	186¾	59⅞
1 5/16	31	46½	13¼	2 14/16	137 6/10	192⅝	62⅝
1 6/16	34	51	14½	2 15/16	141 7/10	198⅜	65½
1 7/16	37⅛	55⅝	15⅞	3	145 8/10	204 1/10	68⅜
1 8/16	40 5/10	58 7/10	17¼	3 1/16	149 8/10	209 7/10	71¼
1 9/16	43 9/10	61 4/10	18¾	3 2/16	153¾	215¼	74¼
1 10/16	47 5/10	66 5/10	20	3 3/16	157 7/10	220¾	77⅜
1 11/16	51¼	71¾	21½	3 4/16	161 6/10	226 2/10	80⅜
1 12/16	55⅛	77⅛	23⅛	3 5/16	165 4/10	231 5/10	83⅝
1 13/16	59⅛	82¾	24⅞	3 6/16	169⅛	236¾	86⅞
1 14/16	63¼	88 5/10	26⅝	3 7/16	172¾	241 8/10	90⅛
1 15/16	67 5/10	94 5/10	28⅜	3 8/16	176 4/10	246 9/10	93½

(*b*) Unstudded close-link chains will be accepted as cables if tested in accordance with the requirements of the following Table and the certificates of test produced.

Short Link Chain Cables.

Minimum Size.	Proved to Statutory Test.	Breaking Test.	Minimum Weight per length of 15 fms.	Minimum Size.	Proved to Statutory Test.	Breaking Test.	Minimum Weight per length of 15 fms.
Ins.	Tons.	Tons.	Cwts.	Ins.	Tons.	Tons.	Cwts.
7/16	2¼	4½	2	1 4/16	18¾	37½	12⅞
8/16	3	6	2½	1 5/16	20⅝	41¼	14⅛
9/16	3¾	7½	3	1 6/16	22⅝	45¼	15½
10/16	4⅝	9¼	3½	1 7/16	24¾	49½	17
11/16	5⅝	11¼	4	1 8/16	27	54	18⅜
12/16	6¾	13½	4¾	1 9/16	29¼	58½	19⅞
13/16	7 9/10	15 8/10	5½	1 10/16	31⅝	63¼	21½
14/16	9⅛	18¼	6⅜	1 11/16	34⅛	68¼	23⅛
15/16	10½	21	7¼	1 12/16	36¾	73½	25
1	12	24	8¼	1 13/16	39 4/10	78 8/10	26⅞
1 1/16	13½	27	9¼	1 14/16	42⅛	84¼	28⅞
1 2/16	15⅛	30¼	10⅜	1 15/16	45	90	30⅞
1 3/16	16 9/10	33 8/10	11⅝	2	48	96	33

TESTS FOR STEEL WIRE TOWLINES, HAWSERS AND WARPS, AND STANDING RIGGING.

Section 14. 1. **General.**—Each Manufacturer is required to provide on his premises machines suitable for making the prescribed tests satisfactorily, and the works are to be at all times open to the inspection of the Society's Surveyors, who are empowered to retest any rope for which a certificate has been issued by the Manufacturer.

2. **Certificates.**—Printed forms of certificates, approved by the Committee, are to be signed by the Manufacturers, and will be supplied to them upon application to the Secretary.

3. **Quality of Ropes.**—The Rules set forth hereunder apply to four qualities of galvanised steel wire ropes, one of which is suitable for steel wire standing rigging, and is composed of six strands of seven wires each. No fibre is to be used in the strands, a fibre core only being fitted.

The other three qualities of rope are for towlines, hawsers and warps, and are designated respectively :—flexible steel wire rope, which is composed of 6 strands of 12 wires each ; special flexible, in which 6 strands of 24 wires each are used ; and special flexible which has 6 strands of 30 wires each, a fibre core being fitted in each strand.

4. **Tests.**—A portion of each steel wire rope is required to stand the tensile test prescribed in the Table, and may be pulled as a finished rope, or a short length of each of the wires composing the finished steel rope may be tested separately, in which case the minimum breaking load of the rope shall be considered to be the sum of the aggregate breaking loads of the individual wires, less a percentage for laying up, as follows :—

6 × 7	.....	5 per cent.
6 × 12	.....	7½ „
6 × 24	.....	10 „
6 × 30	.....	12½ „

Each wire will be required to be capable of being twisted round itself not less than nine times, and of being untwisted eight times and straightened without breaking or splitting.

71, Fenchurch Street,
London, E.C.3.
12*th December*, 1929.

Sizes and Breaking Tests of Steel Wire Ropes.

Circumference of Ropes.	Standing Rigging Wire Ropes. (*a*)	Galvanised Flexible Wire Ropes. (*b*)	Galvanised Special Flexible Wire Ropes.	
			(*c*)	(*d*)
	6×7	6×12	6×24	6×30
Inches.	Tons.	Tons.	Tons.	Tons.
1	1·8	2·0	2·6	2·6
1¼	2·9	3·1	4·4	3·6
1½	4·2	4·8	6·1	5·4
1¾	5·8	6·4	8·7	7·5
2	7·6	8·3	11·2	10·0
2¼	9·5	10·8	14·7	12·8
2½	11·8	13·2	17·7	15·2
2¾	14·3	15·2	21·1	19·6
3	17·1	18·6	25·7	23·5
3¼	20·1	21·7	29·7	25·6
3½	23·4	25·7	35·2	30·1
3¾	26·9	29·3	39·9	34·9
4	30·3	33·2	44·9	40·1
4¼	34·3	36·4	51·5	45·6
4½	38·5	43·3	58·6	51·4
4¾	43·0	47·0	64·6	57·6
5		52·8	70·9	64·2
5¼			77·5	71·2
5½			84·4	76·6
5¾			91·5	82·3
6			99·1	92·1
6¼			104·5	98·3
6½			112·3	104·7
6¾			120·3	111·2
7			130·7	120·0
7½				131·8
8				148·8

Section 15. — Cancelled. Now incorporated in Section 14.

By order of the Committee,
ANDREW SCOTT,
Secretary.

EXTRACTS FROM THE RULES

OF THE LATE

UNDERWRITERS' REGISTRY FOR IRON VESSELS (FOR 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING),

SHOWING THE CONDITIONS OF CLASSIFICATION.

REVISION OF CERTIFICATE OR SUSPENSION OF CLASS.

The certificate of class will remain good so long as the vessel, under periodical survey, is found worthy of it. In case of defects reported by the Surveyors not being made good, the class of the vessel will be revised or suspended by the Committee.

REFERENCE IN CASE OF COMPLAINT.

Any dispute shall be referred to three Shipbuilders or Engineers, one to be chosen by the Shipowner, one to be chosen by this Committee, and a third to act as umpire, to be chosen by the other two.

SURVEY FEES.

For surveying vessels periodically to ascertain condition, first visit	£1 1 0
For each succeeding visit, when more than one visit is necessary	0 10 6

For special surveys special charges will be made, subject to the control of the Committee.

PERIODICAL SURVEYS.

A thorough survey will be required once in every four years for vessels with an A1* or an **A1*** certificate; and once in every three years for vessels with an A1, **A1**, A or an **A** certificate. When vessels are abroad at the time they become due for survey, they must be examined on their return to the United Kingdom. The Surveyors are at all times to have free access to examine vessels holding a class in this Registry.

Vessels due for Periodical Survey which leave the United Kingdom without being duly surveyed and passed by the Surveyors to this Registry will have their class suspended until such survey has been properly made. Notice of Suspension of Class will be given in the first Supplement issued after the sailing of the vessel.

Vessels remaining abroad for two years after they become due for Periodical Survey will have their Class suspended until they have been re-surveyed.

First Survey.

The vessel to be placed in dry dock. (The bottom may be cleaned, but should not be recoated before survey.) While in dry dock the rudder, rudder pins and gudgeons, and the whole of the bottom outside, are to be thoroughly examined, and in steamers the connections of the sea-cocks and openings in the bottom are to be examined, to see that they are in an efficient condition.

The holds, and, in steamers, the bunkers also, are to be cleared, the loose ceiling in the flat of bottom is to be lifted, and the Surveyor is to satisfy himself that the bottom inside is in good order, and that the cement is in good condition and satisfactorily adhering to the iron.

He is also to examine the decks, beam ends, and the sides of holds and 'tween decks, all fore and aft. In steamers the bilges and limbers under engines and boilers are to be cleaned out, so as to allow these parts to be examined by the Surveyor. In water-ballast steamers the tanks are to be examined externally and, if the Surveyor deems it necessary, they are to be tested under the pressure due to the ballast-trim water-line, and sufficient ceiling removed to enable the Surveyor to satisfy himself of their tightness. In all cases the tanks are to be emptied, and examined inside. In all vessels any repairs that may be needed are to be done, and the vessel cleaned and painted as may be necessary.

Second Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

A strake of ceiling must be lifted in the bilges to allow an examination of the condition of the iron surfaces there and of the cement.

The windlass must be unhung when the main piece is of wood ; and the chain cables must be ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water-line.

Third Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

The whole of the close ceiling must be removed, and all the cement exposed and examined. The vessel must be cleaned and scaled, and, if the Surveyor deems it necessary, the plating and other parts must be drilled as he may direct, to ascertain the thickness. In steamers the water ballast tanks must be tested under the pressure due to ballast-trim water-line.

Fourth Survey.

The vessel to be submitted to the same survey as before described for "First Survey," with the following additions :—

The windlass, if the main piece is of wood, must be unhung, and the chain cables ranged out for examination. In steamers the water ballast tanks must be tested under the pressure due to the ballast trim water-line.

Fifth Survey.

The vessel must be submitted to the same survey as before described for "Second Survey."

Sixth Survey or Special Survey.

The vessel must be submitted to the same survey as before described for "Third Survey," with the following additions :—

The actual condition and thickness of all the scantlings must be ascertained, the shell plating being drilled on at least three vertical lines in each strake, viz., forward, amidships, and aft, and elsewhere, at the discretion of the Surveyor, as he may direct.

A report of the vessel's condition and scantlings is to be submitted to the Committee, and such part or parts as they may direct are to be renewed, or otherwise strengthened.

After a vessel has passed her sixth survey, and been approved by the Committee she must be submitted to the same series of surveys, commencing with the "First Survey," and at the same periodical intervals as before.

In steamers, whenever the engines or boilers are removed, a survey is to be held on the vessel's bottom in way thereof, and such repairs as are necessary must be effected before the engines or boilers are replaced.

The preceding rules for periodical surveys are not to limit the Surveyor's discretion, if, in his judgment, it is necessary to make a more complete examination at any time ; and, before completing the report, the Surveyor must, at every periodical survey, satisfy himself that the vessel and her equipment are in a good and efficient condition.

The "Third Survey" must be complied with before the expiration of thirteen years from the date of launch for vessels with an A1* or A1* certificate, ten years for vessels with an A1 or A1 certificate, and nine years for vessels with an A or A certificate ; and the "Sixth Survey" before the expiration of twenty-six years from the date of launch for vessels with an A1* or A1* certificate, twenty years for vessels with an A1 or A1 certificate, and eighteen years for vessels with an A or A certificate.

EXTRACTS FROM THE RULES of the late UNDERWRITERS' REGISTRY FOR IRON VESSELS (for 1884-85)

(NOW UNITED WITH LLOYD'S REGISTER OF SHIPPING).

EQUIPMENT FOR STEAM VESSELS.

Section 29.—The equipment of Anchors and Chain Cables and Hawsers to be in accordance with TABLE 14 for Steam Vessels (*see below*).

The tonnage regulating equipment is to be the gross register tonnage under upper deck, with the addition of three-tenths of the tonnage of erections above upper deck.

TABLE No. 14.—ANCHORS, CHAINS, AND HAWSERS FOR STEAM VESSELS.

VESSELS TONNAGE. *See Section 29.*	Anchors, with either Iron or Wood Stocks.								Stud-chain Cables.			Stream Chain.		Hawsers and Warps.				VESSELS TONNAGE. *See Section 29.*
	Number.			Weight.					Minimum Size.	Proved to Admiralty Test.	Length.			Tow Rope.	Hawsers.	Warps.	Length.	
				Bowers.		Stream.	Kedge.	2nd Kedge.										
	Bowers.	Stream.	Kedges.	Without Stock.	Admiralty Test.													
Tons. Tons.				Cwt.	Tons.	Cwt.	Cwt.	Cwt.	Inches.	Tons.	Fathoms.	Fath.	Size.	Inches.	Inches.	Inches.	Fath.	Tons. Tons.
100 and under 150	2	1	...	3	4·9	1	...	...	$1\frac{1}{16}$	8·1	120	45	$\frac{8}{16}$	$5\frac{1}{2}$	$3\frac{1}{2}$	...	90	100 and under 150
150 „ 188	2	1	1	4	6·4	$1\frac{3}{4}$	1	...	$1\frac{3}{16}$	11·9	150	45	$\frac{9}{16}$	6	4	...	90	150 „ 188
188 „ 225	2	1	1	$5\frac{1}{4}$	7·6	2	1	...	$1\frac{4}{16}$	13·8	165	45	$\frac{10}{16}$	6	4	...	90	188 „ 225
225 „ 263	2	1	1	6	8·2	$2\frac{1}{2}$	$1\frac{1}{4}$	...	$1\frac{5}{16}$	15·8	165	45	$\frac{10}{16}$	$6\frac{1}{2}$	4	...	90	225 „ 263
263 „ 300	2	1	1	$7\frac{1}{4}$	9·5	$2\frac{3}{4}$	$1\frac{1}{4}$	...	1	18	165	45	$\frac{11}{16}$	7	5	...	90	263 „ 300
300 „ 375	3	1	1	$8\frac{1}{4}$	10·4	3	$1\frac{1}{2}$	...	$1\frac{1}{16}$	20·3	165	60	$\frac{11}{16}$	$7\frac{1}{2}$	$5\frac{1}{2}$	...	90	300 „ 375
375 „ 450	3	1	2	10	12·0	$4\frac{3}{4}$	$2\frac{1}{4}$	1	$1\frac{2}{16}$	22·8	195	60	$\frac{12}{16}$	8	6	...	90	375 „ 450
450 „ 525	3	1	2	12	13·9	5	$2\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{3}{16}$	25·4	195	60	$\frac{12}{16}$	$8\frac{1}{2}$	$6\frac{1}{2}$	...	90	450 „ 525
525 „ 600	3	1	2	$13\frac{1}{2}$	15·2	6	3	$1\frac{1}{2}$	$1\frac{4}{16}$	28·1	210	60	$\frac{13}{16}$	9	7	...	90	525 „ 600
600 „ 675	3	1	2	$15\frac{1}{4}$	16·7	$6\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{5}{16}$	31	210	60	$\frac{13}{16}$	$9\frac{1}{2}$	7	4	90	600 „ 675
675 „ 750	3	1	2	$16\frac{3}{4}$	18·0	7	$3\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{6}{16}$	34	240	60	$\frac{14}{16}$	10	8	5	90	675 „ 750
750 „ 900	3	1	2	18	19·0	8	4	2	$1\frac{7}{16}$	37·2	240	60	$\frac{14}{16}$	10	8	5	90	750 „ 900
900 „ 1050	3	1	2	21	21·6	9	$4\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{8}{16}$	40·5	240	75	$\frac{15}{16}$	10	9	$5\frac{1}{2}$	90	900 „ 1050
1050 „ 1200	3	1	2	$23\frac{1}{2}$	23·5	10	5	$2\frac{1}{2}$	$1\frac{9}{16}$	44	270	75	$\frac{15}{16}$	10	9	$5\frac{1}{2}$	90	1050 „ 1200
1200 „ 1350	3	1	2	$25\frac{1}{2}$	25·2	$10\frac{1}{2}$	$5\frac{1}{4}$	$2\frac{3}{4}$	$1\frac{10}{16}$	47·5	270	75	1	10	$9\frac{1}{2}$	6	90	1200 „ 1350
1350 „ 1500	3	1	2	$27\frac{3}{4}$	26·9	11	$5\frac{1}{2}$	$2\frac{3}{4}$	$1\frac{11}{16}$	51·2	270	75	1	10	10	6	90	1350 „ 1500
1500 „ 1800	3	1	2	30	28·6	12	6	3	$1\frac{12}{16}$	55·1	270	75	$1\frac{1}{16}$	11	$10\frac{1}{2}$	$6\frac{1}{2}$	90	1500 „ 1800
1800 „ 2100	3	1	2	32	30·1	13	$6\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{13}{16}$	59·1	270	75	$1\frac{1}{16}$	11	11	7	90	1800 „ 2100
2100 „ 2400	3	1	2	34	31·6	$13\frac{1}{2}$	$6\frac{3}{4}$	$3\frac{1}{4}$	$1\frac{14}{16}$	63·3	270	75	$1\frac{2}{16}$	11	11	7	90	2100 „ 2400
2400 „ 2700	3	1	2	$36\frac{1}{2}$	33·4	14	7	$3\frac{1}{2}$	$1\frac{15}{16}$	67·6	270	90	$1\frac{2}{16}$	12	12	8	90	2400 „ 2700
2700 „ 3000	3	1	2	38	34·5	$14\frac{1}{2}$	$7\frac{1}{4}$	$3\frac{1}{2}$	2	72	270	90	$1\frac{3}{16}$	12	12	8	90	2700 „ 3000
3000 „ 3450	3	1	2	40	35·7	15	$7\frac{1}{2}$	$3\frac{3}{4}$	$2\frac{1}{16}$	76·6	270	90	$1\frac{3}{16}$	12	12	8	90	3000 „ 3450
3450 „ 3900	3	1	2	41	37·0	16	8	$4\frac{1}{4}$	$2\frac{2}{16}$	81·3	300	90	$1\frac{3}{16}$	12	12	8	90	3450 „ 3900
3900 „ 4500	4	1	2	43	38·0	$17\frac{1}{2}$	$8\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{3}{16}$	86·1	300	90	$1\frac{4}{16}$	12	12	9	90	3900 „ 4500
4500 „ 5250	4	1	2	45	39·2	19	$9\frac{1}{2}$	$4\frac{3}{4}$	$2\frac{4}{16}$	91·1	330	90	$1\frac{4}{16}$	12	12	9	90	4500 „ 5250
5250 „ 6000	4	1	2	47	41	21	10	5	$2\frac{5}{16}$	96	330	90	$1\frac{5}{16}$	12	12	9	90	5250 „ 6000

Anchors and Chains to be tested to Admiralty proof. A reduction of 15 per cent. will be allowed in the weight of the Third and Fourth Bower.

LLOYD'S REGISTER OF SHIPPING.

STEEL MANUFACTURERS.

The following firms having applied to have the steel produced by them tested by a Surveyor to this Society and their mode of procedure reported upon, their applications have been complied with and the Surveyors' reports found satisfactory by the Committee.

Firms in Great Britain and Ireland.

Acme Steel and Foundry Co., Shettleston, near Glasgow. (*Steel castings.*)

Allen, Edgar, & Co., Lim., Imperial Steel Works, Tinsley, Sheffield. (*Steel castings.*)

Appleby Iron Co., Lim., Scunthorpe, Lincs. (*Steel plates and blooms.*)

Atlas (The) Steel Foundry and Engineering Co., Lim., Armadale, West Lothian. (*Steel castings.*)

Babcock & Wilcox, Lim., Renfrew. (*Small steel castings.*)

Baird, Archibald, & Son, Lim., Hamilton, near Glasgow. (*Steel castings.*)

Baker, John, & Co. (Rotherham), Lim., Kilnhurst Steel Works, near Rotherham. (*Steel ingots for forgings.*)

Baldwins, Lim., Elba Steel Works, Gowerton, Glamorganshire. (*Steel ingots, billets, and bars.*)

Barrow Hæmatite Steel Co., Lim., Barrow-in-Furness.

Bauly (H.C.), Lim., Dagenham Dock Steel Foundry & Engineering Works, Dagenham Dock, Essex. (*Small steel castings.*)

Beardmore, William, & Co., Lim., Parkhead, Glasgow; and Mossend, Lanarkshire.

Bessemer, H., & Co., Lim., Bessemer Works, Sheffield, Yorkshire.

Beyer, Peacock & Co., Lim., Gorton Foundry, Manchester. (*Steel castings.*)

Blackett, Hutton & Co., Cleveland Steel and Iron Works, Guisborough, Yorkshire. (*Steel castings.*)

British Chilled Roll & Engineering Co., Lim., Empire Works, Haverton Hill, Middlesbrough. (*Small steel castings.*)

British (Guest Keen Baldwins) Iron & Steel Co., Lim.,
Dowlais (Glamorgan) and Cardiff. (*Plates and bars.*)
Port Talbot Steel Works, Port Talbot, South Wales.
Margam Steel Works, Port Talbot. (*Steel ingots and billets.*)

British Mannesmann Tube Co., Lim., Landore, S. Wales. (*Weldless rolled or drawn steel hollow pillars and davits.*)

Briton Ferry Steel Co., Lim., Briton Ferry, Glamorganshire. (*Rivet bars only.*)

Brown, John, & Co., Lim., Atlas Steel & Iron Works, Sheffield; and Scunthorpe Works, Scunthorpe, Lincs. (*Steel castings.*)

Brown, Bayley's Steel Works, Lim., Sheffield. (*Steel ingots, forgings, and bars.*)

Brown, Lenox & Co., Lim., Pontypridd. (*Steel castings.*)

Brymbo (The) Steel & Ingot Iron Works, near Wrexham, Denbighshire. (*For bars only.*)

Butterley Co., Lim., Codnor Park, near Alfreton, Derbyshire.

Cargo Fleet Iron Co., Lim., Cargo Fleet, near Middlesbro'-on-Tees. (*Sections and bars.*)

Carntyne Steel Castings Co., Moorpark, Renfrew. (*Steel castings.*)

Catton & Co., Lim., Yorkshire Steel Foundry, Hunslet, Leeds. (*Steel castings.*)

Clarke, Chapman & Co., Lim., Gateshead-on-Tyne. (*Small steel castings.*)

Clayton & Shuttleworth, Lim., Lincoln. (*Steel castings.*)

Clyde Alloy Steel Co., Lim., Craigneuk Works, Flemington, Motherwell. (*Small steel castings.*)

Coghlan Steel & Iron Co., Lim., Hunslet Forge, Leeds. (*Rolling Mills for bars; forgings.*)

Coltness Iron Co., Lim., Newmains, Lanarkshire. (*Steel castings.*)

Colville, David, & Sons, Lim.,

Dalzell Steel and Iron Works, Motherwell, Lanarkshire.

Clydebridge Steel Works, Cambuslang, near Glasgow.

Glengarnock Iron and Steel Works, Glengarnock, Ayrshire. (*Sections and bars.*)

Consett Iron Co., Lim., Blackhill, Durham.

Cook, Joseph, Sons & Co. (1930), Lim., Washington Steel & Iron Works, Washington Station S.O., co. Durham. (*Steel castings.*)

Darlington Forge Co., Lim., Darlington. (*Steel castings.*)

Darlington Rolling Mills Co., Lim., Darlington. (*Rolling Mills for sections and bars.*)

Dorman, Long & Co., Lim. (Incorporating Bolckow, Vaughan & Co., Lim.), Middlesbro'-on-Tees; Cleveland Iron & Steel Works, South Bank, Yorks; Port Clarence, co. Durham; and Redcar Iron and Steel Works, Redcar.

Dudley's (The Earl of) Round Oak Iron and Steel Works, Lim., Brierley Hill, Staffordshire. (*Sections and bars.*)

Dunlop, J., & Co., Lim., Calderbank, Lanarkshire.

English Steel Corporation, Lim.,

Vickers Works, Sheffield. (*Steel ingots, blooms, bars, forgings and castings.*)

Openshaw Works, Manchester. (*Steel ingots, forgings and castings.*)

Cammell Laird's Grimesthorpe Works, Sheffield. (*Steel ingots, forgings and castings.*)

Firth, Thomas, & Sons, Lim., Norfolk Works, Sheffield.

Fox (Samuel) & Co., Lim., Stocksbridge Works, near Sheffield. (*Steel ingots.*)

Frodingham Iron & Steel Co., Lim., Scunthorpe, Lincs. (*Sections and bars.*)

Gilbertson, W., & Co., Lim., Pontardawe, Glamorgan. (*Steel ingots for forgings.*)

Glanmor Foundry Co., Llanelly. (*Steel castings.*)

Glasgow Iron & Steel Co., Lim., Wishaw, Lanarkshire.

Guest, Keen & Nettlefolds, Lim.,

Castle Works, Tydu, near Newport, Mon. (*Rivet and stay bars.*)

London Works, near Birmingham. (*Rivet bars only.*)

Hadfield's Steel Foundry Co., Lim., Sheffield. (*Steel castings.*)

Hamilton, A., & Sons, Lim., Victoria Foundry, East Moors, Cardiff. (*Small steel castings.*)

Head, Wrightson & Co., Lim., Thornaby-on-Tees. (*Steel castings.*)

Hickman (Alfred), Lim., Staffordshire Steel & Ingot Iron Works, Bilston, Staffordshire.

Hopkinson, J., & Co., Lim., Britannia Works, Huddersfield, Yorkshire. (*Steel castings.*)

Hyde (Robert) & Son, Lim., North Stafford Steel Works, Stoke-on-Trent. (*Small steel castings.*)

Industrial Steels, Lim., Stevenson Road, Sheffield. (*Steel ingots, blooms, billets and bars.*)

Jackson, P. R., & Co., Lim., Salford, Manchester. (*Steel castings.*)

Jenkins' (Philip) Sons, Lim., Excelsior Metal Works, Riverside, Neath, Glamorgan. (*Cast steel anchor heads.*)

Jessop, W., & Sons, Lim., Brightside Works, Sheffield.

Jonas & Colver, Lim., Continental Steel Works, Sheffield. (*Rolling Mills for bars; small forgings.*)

Jopling, E., & Sons, Pallion, Sunderland. (*Steel castings.*)

Kryn & Lahy (1928), Lim., Letchworth, Hertfordshire. (*Steel castings.*)

Lake & Elliot, Lim., Proprietors of the Braintree Castings Co., Braintree, Essex. (*Small steel castings.*)

Lanarkshire Steel Co., Lim., Motherwell, Lanarkshire.

Lancashire & Yorkshire Railway Co., Horwich, Lancashire. (*Steel castings.*)

Leeds Forge Co., Lim., Leeds.

Leyland Motors, Lim., Farington Steel Works, Leyland, Lancashire. (*Steel castings.*)

Lilleshall Co., Lim., Priors Lee Hall, nr. Shifnal, Salop. (*Steel ingots.*)

Lloyd, F. H., & Co., Lim., James Bridge, near Wednesbury, Staffordshire. (*Steel castings.*)

Lumb, James, & Sons, Lim., Elland, Yorkshire. (*Steel castings.*)

Monk Bridge Iron & Steel Co., Lim., Leeds. (*Sections, bars and forgings.*)

Monks, Hall & Co., Lim., Warrington. (*Rolling Mills for bars.*)

Motherwell Iron & Steel Co., Lim., Motherwell, Lanarkshire. (*Angles and bars.*)

National Steel Foundry (1914), Lim. (The), Kirkland Works, Leven, Fifeshire. (*Steel castings.*)

North British (The) Steel Foundry, Lim., Balbardie Steel Works, Bathgate. (*Small steel castings.*)

Osborn, S., & Co., Clyde Steel & Iron Works, Sheffield. (*Steel castings.*)

Palmers Shipbuilding & Iron Co., Lim., Jarrow-on-Tyne.

Park Gate Iron & Steel Co., Lim., Rotherham, Yorkshire.

Partington Steel & Iron Co., Irlam, Manchester. (*Billets, bars, sections, and steel castings.*)

Patent Shaft & Axletree Co., Lim., Wednesbury, Staffordshire.

Pather Iron & Steel Co., Lim., Wishaw, Lanarkshire. (*Rolling Mills.*)

Pearson & Knowles Coal & Iron Co., Lim. (The), Warrington. (*Rolling Mills for sections and bars.*)

Pease & Partners, Lim., Skinningrove Iron Works, Saltburn-by-the-Sea. (*Sections and bars.*)

Raine & Co., Lim., Delta Iron & Steel Works, Derwenthaugh, Newcastle-on-Tyne. (*Rolling Mills for sections and bars.*)

Redbourn Hill Iron & Coal Co., Lim., Frodingham, Lincolnshire. (*Steel ingots and billets.*)

Redheugh Iron & Steel Co., Lim., Teams, Gateshead-on-Tyne. (*Rolling Mills and Steel Foundry.*)

Renton & Fisher, Lim., Hopetoun Steel Works, Bathgate. (*Steel castings.*)

Richmond Iron & Steel Co., Richmond Iron Works, Stockton-on-Tees. (*Rolling Mills for stay and rivet bars.*)

Rogerson, John, & Co., Lim., Wolsingham, co. Durham. (*Steel castings.*)

Rowlands, F. W., & Co., Seacombe, Cheshire. (*Small steel castings.*)

Scottish Iron & Steel Co., Lim., Coatbridge, Lanarkshire. Waverley Works and North British Works (*Steel angles and bars*); Northburn Works. (*Steel ingots and billets.*)

Shaw, W., & Co., Middlesbro'-on-Tees. (*Steel castings.*)

Shelton Iron, Steel & Coal Co., Lim., Stoke-on-Trent.

Smith & McLean, Lim., Mossend, and Gartcosh, Lanarkshire. (*Rolling Mills.*)

South Durham Steel & Iron Co., Lim., West Hartlepool.

Springfield Steel Co., Lim., 777, London Road, Glasgow. (*Steel castings.*)

Steel Castings, Lim., Parkhead, Glasgow. (*Steel castings.*)

Steel Company of Scotland, Lim., Newton, Glasgow; and Blochairn, Glasgow.

Steel, Peech & Tozer, Lim., Sheffield. (*Steel ingots, blooms, forgings, rivet and stay bars.*)

Stewarts & Lloyds, Lim. (Clydesdale Steel and Iron Works), Mossend, Lanarkshire.

„ „ „ Sun Foundry, Coatbridge, Lanarkshire. (*Steel castings.*)

Stockton Steel Foundry Co., Lim., Stockton-on-Tees. (*Steel castings.*)

Summers, John, & Sons, Lim., Hawarden Bridge Steel Works, Shotton, Chester. (*Steel ingots and billets.*)

Summerson, Thomas, & Sons, Lim., Darlington. (*Small steel castings.*)

Tennent (R. B.), Lim., Whifflet Foundry, Coatbridge, Lanarkshire. (*Steel castings.*)

Thwaites Brothers, Lim., Bradford. (*Small steel castings.*)

Towler, William, & Co., Lim., Globe Foundry, Leeds. (*Small steel castings.*)

Tyzack, Samuel, & Co., Lim., Monkwearmouth Iron & Steel Works, Sunderland. (*Sections and bars.*)

United Strip and Bar Mills, Lim., The Ickles, Sheffield. (*Rolling Mills for bars.*)

Vickers-Armstrongs, Lim.,

Barrow-in-Furness. (*Steel castings and forgings.*)

Elswick Works, Elswick, Northumberland. (*Steel castings.*)

Vickers-Petters, Lim., Ipswich Works, Ipswich. (*Steel castings.*)

Whitehead Iron & Steel Co., Lim., Deighton Works, Tredegar, Mon. (*Rolling Mills for steel bars and sections*) ; Courtybella Works, Newport, Mon. (*Rolling Mills for steel strips.*)

Wigan Coal & Iron Co., Lim., Wigan, Lancashire. (*Sections and bars.*)

FIRMS IN COUNTRIES OTHER THAN GREAT BRITAIN AND IRELAND.

ALPHABETICALLY ARRANGED.

In the following list the name of each works is followed by the place of residence of the Surveyor giving attendance thereat.

Acciaieria & Ferriere del Caleotto, Castello Sopra Lecco, Italy. (*Steel bars and small sections.*) (GENOA.)

Acciaieria Danieli & Co., Brescia, Italy. (*Steel castings.*) (GENOA.)

Acciaierie & Ferriere Lombarde; Head Office, Milan. (*Works* at Milan, *weldless rolled or drawn steel tubes and hollow pillars.*) (*Works* at Sesto S. Giovanni, *bars, sections, steel castings, and steel plates.*) (GENOA.)

Aciéries de Gennevilliers, Gennevilliers, near Paris. (*Small steel castings.*) (PARIS.)

Aciéries de Grenelle (E. Plichon), 56, Rue Lourmel, Paris. (*Steel castings.*) (PARIS.)

Aciéries de Haine St. Pierre & Lesquin, Lesquin-lez-Lille (Nord), France. (*Steel castings.*) (DUNKIRK.)

Aciéries de Maromme (E. Breton), Maromme (Seine Inférieure), France. (*Steel castings.*) (ROUEN.)

Aciéries de Mons, Nimy, Belgium. (*Small steel castings.*) (ANTWERP.)

Aciéries de Nanterre, Société Anonyme, Nanterre (Seine), France. (*Steel castings.*) (PARIS.)

Aciéries de Paris et d'Outreau, Outreau (Pas de Calais), France. (*Steel castings.*) (DUNKIRK.)

Aciéries de Sambre et Meuse, Jeumont (Nord), France. (*Steel castings.*) (ANTWERP.)

Aciéries et Ateliers de Grosse Forge, Maurice Dembiermont & Cie., Hautmont (Nord), France. (*Steel forgings.*) (ANTWERP.)

Aciéries & Usines a Tubes de la Sarre, Division Aciéries, Sarrebrück-Burbach. (*Steel castings.*) (METZ.)

Aciéries Réunies de Burbach-Eich-Dudelange (Arbed). Works at Burbach and Hostenbach, Saarbrucken-Burbach; and Dommeldange, Luxembourg. (*Steel ingots, castings and forgings.*) (METZ.)

Adirondacks Steel Foundries Corporation, Watervliet, N.Y., U.S.A. (*Steel castings.*) (NEW YORK.)

Aktiebolaget Abjörn Anderson, Svedala, near Malmö, Sweden. (*Steel castings.*) (MALMÖ.)

Aktiebolaget Bofors, Bofors, Sweden. (*Melting Furnaces and Foundry* at Bofors.) (GOTHENBURG.)

Aktiebolaget Dalsbruk, Dalsbruk, Finland. (*Steel ingots, forgings, castings, bars and angles.*) (HELSINGFORS.)

Aktiebolaget Lindholmen-Motala, Motala Verkstad, Sweden. (*Melting Furnaces, Rolling Mills and Forge.*) (GOTHENBURG.)

Alan Wood, Iron & Steel Company, Conshohocken and Ivy Rock, Pa., U.S.A. (*Blooms, billets and thin plates.*) (PHILADELPHIA.)

Algoma Steel Corporation, Lim., Sault St. Marie, Ontario, Canada. (*Steel billets, bars and angles.*) (TORONTO.)

Allegheny Steel Co., Brackenridge, Pa., U.S.A. (*Also steel castings.*) (PITTSBURGH.)

Alti Forni ed Acciaierie della Venezia Giulia, Servola, near Trieste. (TRIESTE.)

American Bridge Co., Pencoyd Iron Works, Pencoyd, Pa., U.S.A. (*Sections, angles and bars.*) (PHILADELPHIA.)

American Locomotive Co., Chester, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

American Machine & Manufacturing Co., Atlanta, Ga., U.S.A. (*Steel castings.*) (NEW ORLEANS, LA.)

American Manganese Steel Co., Newcastle, Del., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

American Rolling Mill Co., Middletown, O., U.S.A. (*Steel castings and forgings.*) (CLEVELAND, O.)

American Steel & Wire Co. (Shoenberger Works), Fifteenth St., Pittsburgh, Pa., U.S.A. (*Steel ingots, etc.*) (PITTSBURGH.)

American Steel Foundries, Chester, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

American Steel Foundries, Indiana Harbor, Ind., U.S.A. (*Steel castings.*) (CHICAGO.)

Andrews Steel Co., Newport, Kentucky, U.S.A. (*Ingots, blooms, billets and slabs.*) (CLEVELAND, O.)

Anniston Electric Steel Corporation, Anniston, Ala., U.S.A. (*Steel castings and rivet bars.*) (NEW ORLEANS, LA.)

Asano Kokura Steel Co., Lim., Konomimachi, Kokura, Japan. (*Ingots.*) (NAGASAKI.)

Asano Shipbuilding Co., Lim., Tsurumi, Japan. (*Rolling Mills for plates.*) (YOKOHAMA.)

Atlantic Steel Castings Co., Chester, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

Atlas Steel Casting Co., Buffalo, N.Y., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

Atlas-Werke Akt. Ges., Bremen. (*Steel castings.*) (BREMEN.)

Avesta Jernverks Aktiebolag, Avesta, Sweden. (*Steel plates, sections, and high pressure air receivers.*) (STOCKHOLM.)

Baildonhütte, Spolka Akcyjna, Kattowice, Gorny Slask, Poland. (VIENNA.)

Baume & Marpent, Société Anonyme, Haine St. Pierre, Belgium. (*Small steel castings.*) (ANTWERP.)

Bayonne Steel Casting Co., Bayonne, N.J., U.S.A. (*Steel castings.*) (NEW YORK.)

Berg-und Hüttenwerks Gesellschaft, Brno, Czecho-Slovakia. (*Works* at Trzynietz and Karlshütte.) (VIENNA.)

Bergische Stahl-Industrie Kommanditgesellschaft, Remscheid, Germany. (*Steel ingots and castings.*) (DÜSSELDORF.)

Berliner Actiengesellschaft für Eisengiesserei und Maschinenfabrikation, Berlin-Charlottenburg, Germany. (*Small steel castings.*) (STETTIN.)

Best Steel Casting Co., San Francisco, Cal., U.S.A. (*Steel castings.*) (SAN FRANCISCO.)

Bethlehem Steel Co.,

Bethlehem, Pa., U.S.A. (PHILADELPHIA.)

Buffalo, N.Y., U.S.A. (CLEVELAND, O.)

Coatesville, Pa., U.S.A. (*Rolling Mills for plates and bars.*) (PHILADELPHIA.)

Lebanon, Pa., U.S.A. (*Rolling Mills for bars.*) (BALTIMORE.)

Reading, Pa., U.S.A. (*Rolling Mills for bars.*) (PHILADELPHIA.)

Sparrow's Point, Md., U.S.A. (BALTIMORE.)

Steelton, Pa., U.S.A. (BALTIMORE.)

Birdsboro' Steel Foundry & Machine Co., Birdsboro', Pa., U.S.A. (*Steel castings and ingots.*) (PHILADELPHIA.)

Bismarckhütte (Bismarckhütte & Falvahütte), Hajduki Wielkie, Gorny Slask, Poland. (*Also steel castings, and weldless rolled or drawn steel hollow pillars and davits.*) (VIENNA.)

Björneborgs Jernverks Aktiebolag, Björneborg, Sweden. (*Melting Furnaces and Forge.*) (GOTHENBURG.)

Blohm & Voss, Hamburg, Germany. (*Steel castings.*) (HAMBURG.)

Böhler, Gebr., & Co., Akt. Ges., Vienna. (*Works* at Kapfenberg, Styria, Austria.) (*Steel castings.*) (VIENNA.)

Bonney-Floyd Co., Columbus, O., U.S.A. (*Steel castings.*) (COLUMBUS, O.)

Borsig, A., G.m.b.H., Berlin-Tegel, Germany. (*Steel ingots, forgings and castings.*) (STETTIN.)

Borsigwerk Akt. Ges., Borsigwerk, Upper Silesia, Germany, (*Also steel castings.*) (VIENNA.)

Bourne Fuller Co., Cleveland, O., U.S.A. (*Round and square steel bars.*) (CLEVELAND, O.)

Bradford & Kendall, Lim., Alexandria, Sydney, N.S.W. (*Steel castings.*) (SYDNEY, N.S.W.)

Brier Hill Steel Co. (The), Youngstown, O., U.S.A. (PITTSBURGH.)

Broken Hill Proprietary Co., Lim., Iron and Steel Works, Newcastle, N.S.W. (*Steel plates, bars, sections and castings.*) (NEWCASTLE, N.S.W.)

Buhl Malleable Co., Detroit, Mich., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

Bultfabriks Aktiebolaget, Hallstahammar, Sweden. (*Steel castings.*) (STOCKHOLM.)

Burmeister & Wain's Maskin-og Skibsbyggeri, Aktieselskabet, Copenhagen. (*Steel ingots, forgings and castings.*) (COPENHAGEN.)

Cambria Steel Co., Johnstown, Pa., U.S.A. (PITTSBURGH.)

Canada Foundries & Forgings, Lim., Welland, Ontario. (*Steel forgings.*) (CLEVELAND, O.)

Canadian Steel Foundries, Lim., Longue Pointe, Montreal. (*Steel castings.*) (MONTREAL.)

Cantieri Navali ed Acciaierie di Venezia, Marghera, Italy. (*Steel castings.*) (TRIESTE.)

Canton Steel Foundry Co., Canton, O., U.S.A. (*Steel castings and ingots.*) (CLEVELAND, O.)

Carbon Steel Co., Pittsburgh, Pa., U.S.A. (PITTSBURGH.)

Carnegie Steel Co., Pittsburgh, Pa., U.S.A. (PITTSBURGH.)

Central Alloy Steel Corporation, Massillon, O., U.S.A. (CLEVELAND, O.)

Central Iron & Steel Co., Harrisburg, Pa., U.S.A. (*Rolling Mills.*) (BALTIMORE.)

Ceskomoravska-Kolben, Prague. (*Steel castings.*) (PRAGUE.)

Chester Steel Castings Co., Chester, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

Chrome Steel Works, Cartaret, New Jersey, U.S.A. (*Steel castings.*) (NEW YORK.)

Cleveland Steel Casting Co., Cleveland, O., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

Colorado (The) Fuel & Iron Co., Minnequa Works, Pueblo, Colo. (*Bars and small sections.*) (CHICAGO.)

Columbia Steel Company, Pittsburgh, Cal., U.S.A. (*Steel castings.*) (SAN FRANCISCO.)

Columbia Steel Co., Portland, Or., U.S.A. (*Steel castings.*) (PORTLAND, OREGON.)

Columbia Steel Company, Torrance, Cal., U.S.A. (*Round bars, small sections, also steel castings.*) (SAN FRANCISCO.)

Commonwealth Government Naval Dockyard, Cockatoo, Sydney, N.S.W. (*Steel castings.*) (SYDNEY, N.S.W.)

Commonwealth Steel Products Co., Lim., Waratah, Newcastle, N.S.W. (*Steel castings and forgings.*) (NEWCASTLE, N.S.W.)

Compagnie de Fives Lille, Société Anonyme, Fives Lille (Nord), France. (*Steel ingots, castings and forgings.*) (DUNKIRK.)

Compagnie des Forges de Chatillon, Commentry et Neuves-Maisons, France. (ST. ETIENNE.)

Compagnie des Forges et Aciéries de la Marine et d'Homécourt, Hautmont (Nord), France. (*Rolling Mills for bars and sections.*) (ANTWERP.)

Compagnie des Forges et Aciéries de la Marine et d'Homécourt, Homécourt (Meurthe & Moselle), France. (METZ.)

Compagnie des Forges et Aciéries de la Marine et d'Homécourt, Le Boucau (Forges de l'Adour), (Basses-Pyrénées), France. (*Bars and sections.*) (BORDEAUX.)

Compagnie des Forges et Aciéries de la Marine et d'Homécourt, St. Chamond (Loire), France. (ST. ETIENNE.)

Compagnie des Mines, Fonderies & Forges d'Alais, Tamaris Works, Alais, France. (*Bars and sections.*) (MARSEILLES.)

Compagnie des Mines, Fonderies & Forges d'Alais, Marseilles, France. (*Steel castings.*) (MARSEILLES.)

Compagnie Générale des Aciers, Société Anonyme, Thy-le-Chateau, Bélgium. (*Steel castings.*) (ANTWERP.)

Compañia Anonima Basconia, Bilbao, Spain. (BILBAO.)

Compañia Fabrica de Trubia, Trubia Asturias, Spain. (*Steel castings and forgings.*) (BILBAO.)

Compañia Siderurgica del Mediterraneo, Sagunto, Spain. (*Steel ingots, bars and sections.*) (VALENCIA.)

Corrigan, McKinney & Co., Cleveland, O., U.S.A. (*Steel ingots, blooms and billets.*) (CLEVELAND, O.)

Crucible Steel Castings Co., Landsdowne, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

Crucible Steel Company of America, Park Works, Pittsburgh, Pa., U.S.A. (PITTSBURGH.)

Cumming (J. W.) Manufacturing Co., Lim., New Glasgow, Nova Scotia. (*Small steel castings.*) (HALIFAX, N.S.)

Detroit Steel Casting Co., Detroit, Mich., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

Deutsche Schiff und Maschinenbau Aktiengesellschaft, Werk Act. Ges. "Weser," Bremen, Germany. (*Small steel castings.*) (BREMEN.)

Deutsche Werke A. G., Kiel, Germany. (*Steel castings.*) (HAMBURG.)

Dominion Foundries & Steel Lim., Hamilton, Ontario. (*Steel ingots, plates and castings.*) (TORONTO.)

Dominion Iron & Steel Co., Lim., Sydney, Nova Scotia. (*Steel ingots, billets, plates and sections.*) (HALIFAX, N.S.)

Donner Steel Co., Inc. (The), Buffalo, N.Y., U.S.A. (CLEVELAND, O.)

Drain Steel Co., Moore, Pa., U.S.A. (*Steel ingots.*) (PHILADELPHIA.)

Drammens Jernstoberi A/S., Drammen, Norway. (*Small Steel castings.*) (OSLO.)

Eagan-Johnson Steel and Iron Co., Inc., Crum Lynne, Pa., U.S.A. (*Small steel castings.*) (PHILADELPHIA.)

Eastern Steel Castings Co., Newark, N.J., U.S.A. (*Steel castings.*) (NEW YORK.)

Eastern Steel Co., Pottsville, Pa., U.S.A. (*Sections and bars.*) (PHILADELPHIA.)

Edelstahlwerk Rochling A.G., Volklingen a.d. Saar. (*Steel ingots, billets, bars and forgings.*) (METZ.)

Eisen-und Stahlwerk Hoesch, Dortmund, Germany. (*Rolling Mills.*) (DÜSSELDORF.)

Electric Steel & Metals Co., Lim., Welland, Ontario. (*Steel ingots and steel castings.*) (CLEVELAND, O.)

Electric Steel Foundry, Portland, Or., U.S.A. (*Steel castings.*) (PORTLAND, OREGON.)

Erie Forge Co., Erie, Pa., U.S.A. (*Steel ingots, forgings and castings.*) (CLEVELAND, O.)

Esercizio Fonderie Filut, Torino, Italy. Head Office in Turin. (Works at Susa and Rivoli-Vica.) (*Steel castings.*) (GENOA.)

Établissements J. J. Carnaud & Forges de Basse-Indre, Basse-Indre, Loire-Inférieure. (*Also Steel castings.*) (NANTES.)

Fagersta Bruks Aktiebolag, Fagersta, Sweden. (*Steel blooms and billets.*) (STOCKHOLM.)

Falk Corporation, Milwaukee, Wis., U.S.A. (*Steel castings.*) (CHICAGO.)

Federal Steel Foundry Co., Chester, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

Ferriera di Bolzaneto, near Genoa. (*For plates up to $\frac{3}{4}$ in. thickness.*) (GENOA.)

Ferriere di Voltri, Voltri, Italy. (*Small sections, angles and bars.*) (GENOA.)

Ferriere ed Acciaierie del Vesuvio, Torre Annunziata, Naples. (*Rolling Mills for sections and bars.*) (NAPLES.)

Finkl (A.) & Sons Company, Chicago, Ill., U.S.A. (*Steel forgings.*) (CHICAGO.)

Fonderia Milanese di Acciaio Vanzetti, Milan. (*Steel castings.*) (GENOA.)

Fonderies, Forges et Aciéries de St. Etienne, St. Etienne, France. (ST. ETIENNE.)

Fonderies d'Acier du Midi, Marseilles. (*Steel castings.*) (MARSEILLES.)

Forged Steel Wheel Co., Butler, Pa., U.S.A. (PITTSBURGH.)

Forges de la Loire et du Midi (Messrs. Marrel Frères), Rive de Gier, France. (ST. ETIENNE.)

Forges et Laminoirs de Saint Victor, Société Anonyme, Monceau-sur-Sambre, Belgium. (*Steel ingots.*) (ANTWERP.)

Forsbacka Jernverks Aktiebolag, Forsbacka, Sweden. (*Steel blooms, billets, tubes, and forged and rolled bars.*) (STOCKHOLM.)

Friedenshütte, Spolka Akcyjna, Nowy Bytom, Gorny Slask, Poland. (VIENNA.)

Ganz & Co., Danubius Akt. Ges., Ratibor, Upper Silesia, Germany. (*Steel castings.*) (VIENNA.)

Geisweider Eisenwerke Act. Ges., Geisweid (Kreis Siegen), Germany. (*Rolling Mills.*) (DÜSSELDORF.)

Glasgow Iron Co., Pottstown, Pa., U.S.A. (*Rolling Mills for plates.*) (PHILADELPHIA.)

Gould-Coupler Co., Depew, N.Y., U.S.A. (*Steel ingots.*) (CLEVELAND, O.)

Grafenberger Walzwerk G.m.b.H., Düsseldorf-Grafenberg, Germany. (*Rolling Mills.*) (DÜSSELDORF.)

Gruson (Otto) & Co., Eisen und Stahlwerk, Magdeburg-Buckau, Germany. (*Steel castings.*) (DÜSSELDORF.)

Gulf States Steel Co., Alabama City, Ala., U.S.A. (*Rivet and stay bars up to $2\frac{1}{2}$ ins. diameter.*) (NEW ORLEANS, LA.)

Gussstahlwerk Wittmann Aktiengesellschaft, Haspe, near Hagen, Westphalia, Germany. (*Steel castings.*) (DÜSSELDORF.)

Gutehoffnungshütte Oberhausen Aktiengesellschaft, Oberhausen, Rheinland, Germany. (*Also Steel castings.*) (DÜSSELDORF.)

Gutehoffnungshütte, Abteilung Haniel & Lueg, Düsseldorf-Grafenberg, Germany. (*Steel castings.*) (DÜSSELDORF.)

Hadfields (Australia), Lim., Sydney, N.S.W. (*Steel castings and forgings.*) (SYDNEY, N.S.W.)

Hahn (Albert), Röhrenwalzwerk, Bohumin, Czecho-Slovakia. (*Steel ingots, bars and sections.*) (VIENNA.)

Hahnsche Werke Act. Ges., Grossenbaum, near Duisburg, Germany. (*Broad flats and ingots.*) (DÜSSELDORF.)

Hamuro Foundry Co., Osaka, Japan. (*Steel castings.*) (KOBE.)

Han-Yeh-Ping Iron & Coal Co., Lim., Hanyang, China. (HANKOW.)

Hauts-Fourneaux, Fonderies, Forges & Laminoirs de Meurthe & Moselle (Mr. Fould-Dupont), Usines de Pompey, France. (METZ.)

Holtzer, Jacob, & Co., Aciéries d'Unieux, Unieux (Loire), France. (*Steel castings.*) (ST. ETIENNE.)

Hubbard Steel Foundry Co., East Chicago, Ind., U.S.A. (*Steel castings.*) (CHICAGO.)

Huntington Steel Co., Huntington, Ind., U.S.A. (*Steel castings.*) (CHICAGO.)

Hüttengesellschaft der Rothen Erden, Aachen Rothe Erde, Germany. (*Rolling Mills.*) (DÜSSELDORF.)

Ignaz Storek, Brünn, Czecho-Slovakia. (*Steel castings.*) (PRAGUE.)

Illinois Steel Co., Chicago, Ill., U.S.A. (CHICAGO.)

Ilva Alti Forni e Acciaierie d'Italia, Genoa. (GENOA.)
Stabilimento di Pra, Pra.
Stabilimento di Bolzaneto, Bolzaneto.
Stabilimento di Sestri Ponente, Sestri Ponente.
Stabilimento di Savona, Savona.
Stabilimento di Bagnoli, Bagnoli. (*Sections and bars.*) (NAPLES.)

Imperial Steel Works (The), Yawata, Japan. (NAGASAKI.)

Industrial Steel Castings Co., Toledo, O., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

Inland Steel Co. (*Steel Works* at Indiana Harbor, Ind., U.S.A., and *Rolling Mills* at Chicago Heights, Chicago, Ill., U.S.A.) (CHICAGO.)

Interstate Iron and Steel Co., Chicago, Ill., U.S.A. (*Steel Works* at 118th Street, Chicago, and *Rolling Mills* at East Chicago, Ind.) (*Steel angles and bars.*) (CHICAGO.)

Jaeger, G. & J., Kommandit Ges., Elberfeld, Germany. (*Steel castings.*) (DÜSSELDORF.)

Japan Steel Works, Lim. (The), Muroran, Japan. (*Steel ingots, forgings and castings.*) (HAKODATE.)

Jones & Laughlin Steel Corporation, Pittsburgh, Pa., U.S.A. (PITTSBURGH.)

Judson Manufacturing Co., Emeryville, Alameda Co., Cal., U.S.A. (*Steel ingots.*) (SAN FRANCISCO.)

Kawasaki Dockyard Co., Lim. (Fukiai Works), Kobe, Japan. (KOBE.)

Kawasaki Sharyo Kabushiki Kaisha, Shiri-ike-mura, Hiogo, Japan. (*Steel castings, forgings, bars and sections.*) (KOBE.)

Klöckner-Werke A.G., Abteilung Eisen-und Draht-Industrie, Düsseldorf-Oberbilk, Germany. (*Bars and sections only.*) (DÜSSELDORF.)

Klöckner-Werke A. G., Abteilung Georgs-Marien-Werke, Osnabrück, Germany. (*Steel castings.*) (DÜSSELDORF.)

Klöckner-Werke A. G., Abteilung Hasper Eisen-und Stahlwerk, Haspe, Westphalia, Germany. (*Rolling Mills.*) (DÜSSELDORF.)

Klöckner-Werke A. G., Abteilung Mannstaedtwerke, Troisdorf, near Cologne, Germany. (*Rolling Mills for sections.*) (DÜSSELDORF.)

Kobe Steel Works, Lim., Kobe, Japan. (*Steel castings, forgings, and plain and angle bars of small section.*) (KOBE.)

Kohlswa Jernverks Aktiebolag. (*Melting Furnaces, Foundry and Forge* at Kohlswa, Sweden.) (STOCKHOLM.)

Kranjska Industrjska Druzba, Jesenice-Fuzine, Yugoslavia. (TRIESTE.)

Krautheim (G.) Aktiengesellschaft, Chemnitz-Borna, Germany. (*Steel castings.*) (DÜSSELDORF.)

Krupp, Fried., Act. Ges., Stahlwerk Annen in Annen, Westphalia, Germany. (*Steel castings.*) (DÜSSELDORF.)

Krupp, Fried., Act. Ges., Essen, Germany. (*Also Steel castings.*) (DÜSSELDORF.)

Krupp, Fried., Act. Ges., Grusonwerk, Magdeburg, Germany. (*Steel castings.*) (DÜSSELDORF.)

Krupp, Fried., Act. Ges.—Friedrich Alfred Hütte, Rheinhausen—Friemersheim, Germany. (*Bars and sections only.*) (DÜSSELDORF.)

La Belle Iron Works, Steubenville, O., U.S.A. (PITTSBURGH.)

Limited Co., formerly the Skoda-Works, Pilsen. (*Steel castings and forgings.*) (PRAGUE.)

Lindener Eisen & Stahlwerke Akt. Ges., Hannover-Linden, Germany. (*Steel castings.*) (BREMEN.)

Linke-Hofmann-Lauchhammer-Akt. Ges., Abteilung Oberschlesische Werke, Gleiwitz, Upper Silesia, Germany.
Herminenhütte, Laband, Upper Silesia, Germany. (*Small sections and bars.*)
Julienhütte, Bobrek, Upper Silesia, Germany. (*Ingots, blooms and billets.*) (VIENNA.)

Lithgow Iron & Steel Works, Lithgow, N.S.W. (*Bars and sections.*) (SYDNEY, N.S.W.)

Luken's Steel Company, Coatesville, Pa., U.S.A. (PHILADELPHIA.)

Machine Fabriek Yzer-Staal & Metaal Gieterij (v/h Bakker & Co.), Ridderkerk. (*Steel castings.*) (ROTTERDAM.)

Malleable Iron Fittings Co., Branford, Conn. (*Steel castings.*) (NEW YORK.)

Mannesmannröhrenwerke, Abteilung Grillo Funke, Gelsenkirchen Schalke, Westphalia, Germany. (DÜSSELDORF.)

Mannesmannröhrenwerke, Abteilung Schulz Knaudt, Hückingen, Germany. (*Steel Works and Rolling Mills.*) (DÜSSELDORF.)

Mannesmannröhrenwerke Aktiengesellschaft, Svinov-Vitkovice, Czecho-Slovakia. (*Weldless steel tubes.*) (VIENNA.)

Mannesmannröhrenwerke, Bous. (METZ.)

Mannesmannröhrenwerke, Düsseldorf and Remscheid, Germany. (*Weldless rolled or drawn steel hollow pillars and davits.*) (DÜSSELDORF.)

Mannesmannröhrenwerke, Komotau, Czecho-Slovakia. (*Weldless steel tubes.*) (PRAGUE.)

Maschinenfabrik Augsburg-Nürnberg A.G., Augsburg, Germany. (*Steel forgings.*) (AUGSBURG.)

Maynard Electric Steel Castings Co., Milwaukee, Wisconsin, U.S.A. (*Steel castings.*) (CHICAGO.)

Mesta Machine Co., West Homestead, Pa., U.S.A. (*Steel ingots, castings and forgings.*) (PITTSBURGH.)

Michaelsen, Hermann, Eisen-und Stahl-Giesserei, Erdmannstrasse, 23, Altona-Ottensen, Germany. (*Steel castings.*) (HAMBURG.)

Michigan Steel Casting Co., Detroit, Mich., U.S.A. (*Small castings.*) (CLEVELAND, O.)

Midvale Company, Philadelphia, Pa., U.S.A. (*Steel forgings.*) (PHILADELPHIA.)

Miki Cast Steel Works, Lim., Osaka, Japan. (*Small steel castings.*) (KOBE.)

Mitsu Bishi Dockyard & Engine Works, Nagasaki, Japan. (*Steel castings.*) (NAGASAKI.)

Mitsu Bishi Seitetsu Kabushiki Kaisha, Kenjiho, Korea. (KOBE.)

Mitsubishi Zosen Kaisha, Nagasaki Steel Works, Urakami, Nagasaki, Japan. (*Steel ingots, blooms and forgings.*) (NAGASAKI.)

Mitteldeutsche Stahlwerke Akt. Ges., Lauchhammerwerk Gröditz, Gröditz, Germany. (*Steel castings.*) (DÜSSELDORF.)

Mitteldeutsche Stahlwerke Akt. Ges., Lauchhammerwerk Riesa, Riesa, Germany. (*Rolling Mills.*) (DÜSSELDORF.)

Mitteldeutsche Stahlwerke Aktiengesellschaft, Stahl-und Walzwerk Weber, Brandenburg (Havel), Germany. (*Steel plates and ingots.*) (STETTIN.)

Monarch Steel Castings Co., Detroit, Mich., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

N.V. Machinefabriek G. Dikkers & Co., Hengelo, Holland. (*Small steel castings.*) (AMSTERDAM.)

National Enameling & Stamping Co., Granite City, Ill., U.S.A. (CHICAGO.)

National Erie Co., Erie, Pa., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

National Malleable and Steel Castings Co., Sharon, Pa., U.S.A. (*Steel ingots.*) (PITTSBURGH.); and Melrose Park, Chicago, Ill., U.S.A. (*Steel ingots.*) (CHICAGO.)

National Steel Foundries Co., Milwaukee, Wis., U.S.A. (*Steel castings.*) (CHICAGO.)

National Tube Co., Lorain, O., U.S.A. (*Blooms, billets and plates.*) (CLEVELAND, O.)

Nederlandsche Staalfabrieken (v/h J. M. de Muinck Keizer), Utrecht, Holland. (*Steel ingots, blooms, billets and castings.*) (ROTTERDAM.)

New Jersey Steel Co., Rahway, N.J., U.S.A. (*Steel castings.*) (NEW YORK.)

Newport News Shipbuilding & Dry Dock Co., Newport News, Va., U.S.A. (*Steel castings and forgings.*) (NEWPORT NEWS.)

Niemeyer, Georg, Metall-, Stahl-und Eisenwerke, Harburg a.d. Elbe, Germany. (*Steel castings.*) (HAMBURG.)

Nippon Chuko Kabushiki Kaisha, Oshima-Cho, Tokyo, Japan. (YOKOHAMA.)

Nippon Kokan Kabushiki Kaisha, Kawasaki, Japan. (*Steel tubes, bars and sections.*) (YOKOHAMA.)

Nippon Steel Foundry, Lim., Osaka, Japan. (*Steel castings.*) (KOBE.)

Nordische Stahlwerke, Bach & Co., Kommanditgesellschaft, Neumünster, Germany. (*Small steel castings.*) (HAMBURG.)

Northwestern Steel & Iron Corporation, Minneapolis, Minn., U.S.A. (*Steel castings.*) (CHICAGO.)

Nova Scotia Steel & Coal Co., Lim. (*Steel Works* at North Sydney, C.B., and *Rolling Mills* at New Glasgow, N.S.) (*Bars and sections only.*) (HALIFAX, N.S.)

Nydqvist & Holm Aktiebolag, Trollhättan, Sweden. (*Steel castings.*) (GOTHENBURG.)

Oesterreichisch-Alpine Montangesellschaft, Vienna, I., Austria. (*Works* at Donawitz, near Leoben, and Kindberg, Styria, Austria.) (VIENNA.)

Ohio Steel Foundry Co., Lima, O., U.S.A. (CLEVELAND, O.)

Oliver Iron & Steel Co., Pittsburgh, Pa., U.S.A. (*Rolling Mills for bars.*) (PITTSBURGH.)

Olympic Steel Works, Seattle, Wash., U.S.A. (*Steel castings.*) (SEATTLE, WASH.)

Osaka Chain Works, Lim., Osaka, Japan. (*Small steel castings.*) (KOBE.)

Oshima Steel Works, Oshima, Tokio, Japan. (*Steel castings and forgings.*) (YOKOHAMA.)

Otis Elevator Co., Buffalo, N.Y., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

Otis Steel Co. (The), Cleveland, O., U.S.A. (CLEVELAND, O.)

Pacific Coast Steel Co., Seattle, Wash., U.S.A. (*Sections and bars.*) (SEATTLE.)

Pacific Coast Steel Co., South San Francisco, Cal., U.S.A. (*Steel ingots, small sections and bars.*) (SAN FRANCISCO.)

Panzer Akt. Ges., Gussstahlwerk, Wolgast, Germany. (*Small steel castings.*) (STETTIN.)

Pelton Steel Co., Milwaukee, Wis., U.S.A. (*Steel castings.*) (CHICAGO.)

Penn Steel Castings Co., Newcastle, Delaware, U.S.A.; Chester, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

Pennsylvania Forge Co., Bridesburg, Philadelphia, Pa., U.S.A. (*Steel ingots and forgings.*) (PHILADELPHIA.)

Philadelphia Roll & Machine Co., Philadelphia, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

Phœnix Iron Works, Phœnixville, Pa., U.S.A. (PHILADELPHIA.)

Pittsburgh Crucible Steel Co., Midland, Pa., U.S.A. (PITTSBURGH.)

Pittsburgh Steel Foundry, Glassport, Pa., U.S.A. (*Steel castings and ingots.*) (PITTSBURGH.)

Poldihütte Tiegelguss-Stahlfabrik, Kladno, near Prague. (PRAGUE.)

Prazska zelezarska spolecnost, Kladno, near Prague. (PRAGUE.)

Press & Walzwerk Akt. Ges., Reisholz, near Dusseldorf. Abteilung Oberbilker Stahlwerk, Düsseldorf-Oberbilk, Germany. (DÜSSELDORF.)

Preussische Bergwerks- & Hütten-Aktiengesellschaft, Hüttenamt Gleiwitz, Gleiwitz, Upper Silesia, Germany. (*Steel castings.*) (VIENNA.)

Puget Sound Steel Works, Tacoma, Wash., U.S.A. (*Steel castings.*) (SEATTLE.)

Railway Steel Spring Co., Chicago Heights, Ill., U.S.A. (*Steel ingots.*) (CHICAGO.)

Raufoss Ammunisjonsfabrikker, Raufoss, Norway. (*Steel castings.*) (OSLO.)

Reading Steel Casting Co., Reading, Pa., U.S.A. (*Small steel castings.*) (PHILADELPHIA.)

Republic Iron & Steel Co., Youngstown, O., U.S.A. (PITTSBURGH.)

Rheinische Metallwaaren und Maschinenfabrik, Düsseldorf, Germany. (*Steel ingots and forgings; and weldless steel tubes.*) (DÜSSELDORF.)

Rimamurany Salgotarjaner Eisenwerks Act. Ges., Budapest. (*Steel Works* in Ozd, Hungary.) (VIENNA.)

Riverside Steel Casting Co., Kearny, N.J., U.S.A. (*Steel castings.*) (NEW YORK.)

Roxbury Steel Casting Co., Boston, Mass., U.S.A. (*Steel castings.*) (BOSTON.)

Ruhrstahl Aktiengesellschaft, Annener Gussstahlwerk, Witten-Annen, near Dortmund, Westphalia, Germany. (*Steel castings.*) (DÜSSELDORF.)

Ruhrstahl Aktiengesellschaft, Gelsenkirchener Gussstahlwerke, Gelsenkirchen, Germany. (*Steel castings.*) (DÜSSELDORF.)

Ruhrstahl Aktiengesellschaft, Gussstahlwerk Witten, Witten, Germany. (DÜSSELDORF.)

Ruhrstahl Aktiengesellschaft, Henrichshütte, Hattingen, Germany. (DÜSSELDORF.)

Ruhrstahl Aktiengesellschaft, Stahlwerk Krieger, Düsseldorf, Germany. (*Steel castings.*) (DÜSSELDORF.)

Ruwolt (Charles) Proprietary, Lim., Richmond, Melbourne. (*Steel castings.*) (MELBOURNE.)

Sächsische Guss stahlwerke Döhlen Aktiengesellschaft, Döhlen, near Dresden, Saxony. (*Steel ingots and forgings.*) (DÜSSELDORF.)

Sandvikens Jernverks Aktiebolag, Sandviken, Sweden. (*Steel ingots, forgings, and steel tubes.*) (STOCKHOLM.)

Schäffer & Budenberg G.m.b.H., Magdeburg-Buckau, Germany. (*Small steel castings.*) (DÜSSELDORF.)

Schichau, F., Elbing, West Prussia, Germany. (*Steel castings.*) (DANZIG.)

Schmidt (Rudolf) & Co., Vienna. (*Steel Ingots.*) (VIENNA.)

Schneider & Co., Creusot. (ST. ETIENNE.)

Schoeller-Bleckmann Stahlwerke Akt. Ges., Vienna. (*Works* at Mürzzuschlag, Styria (*Steel bars*) and Ternitz, Nieder-Oesterreich. (*Steel bars and castings.*) (VIENNA.)

Scullin Steel Co., St. Louis, Mo., U.S.A. (*Steel castings.*) (CHICAGO.)

Sharon Steel Hoop Co., Youngstown, O., U.S.A. (*Steel melting plant* at Lowellville, O.; and *Rolling mills at* Youngstown, O.) (PITTSBURGH.)

Skoda Works (*see* Limited Co.).

Smedjebackens Valsverks Aktiebolaget, Smedjebacken, Sweden. (*Steel sections and castings.*) (STOCKHOLM.)

Sociedad Altos Hornos de Vizcaya, Bilbao. (BILBAO.)

Sociedad Anonima Aceros de Elorrieta, Bilbao. (*Steel castings.*) (BILBAO.)

Sociedad Anonima Fabrica de Mieres, Ablaña, Asturias, Spain. (BILBAO.)

Sociedad Anonima Fabrica de San Francisco del Desierto, Bilbao. (BILBAO.)

Sociedad Anonima Industrial Asturiana, Fabricas de Moreda y Gijon, Gijon. (*Rivet bars.*) (BILBAO.)

Sociedad Anonima Jose Maria Quijano, Forjas de Los Corrales de Buelna, Provincia de Santander, Spain. (*Steel bars.*) (BILBAO.)

Sociedad Anonima Talleres de Deusto, Deusto, Bilbao. (*Steel castings.*) (BILBAO.)

Sociedad Española de Construccion Naval, Reinosa, near Santander, Spain. (*Steel castings and forgings.*) (BILBAO.)

Sociedad Metalurgica Duro-Felguera, La Felguera, Asturias, Spain. (BILBAO.)

Società Alti Forni, Fonderie, Acciaierie e Ferriere Franchi-Gregorini, Forno d'Allione (Val Camonica), Italy. (*Steel ingots.*) (GENOA.)

Società Alti Forni e Acciaierie d'Italia, Porto Vecchio di Piombino, Italy. (*Sections and bars.*) (GENOA.)

Società Alti Forni, Fonderie, Acciaierie e Ferriere Franchi-Gregorini, Lovere, Italy. (*Bars and sections, castings and forgings.*) (GENOA.)

Società Anonima Acciaierie Elettriche di Sesto San Giovanni, Sesto San Giovanni, Milan, Italy. (*Steel castings.*) (GENOA.)

Società Anonima Ansaldo, Acciaierie e Fonderie di Acciaio, Cornigliano Ligure, Italy. (*Steel ingots, forgings, castings, plates and sections.*) (GENOA.)

Società Anonima Ferriere di Voltri, Stabilimenti di Oneglia e Portomaurizio, Oneglia, Italy. (*Sections and bars.*) (GENOA.)

Società Anonima FIAT,

Sezione Acciaierie, Turin. (*Steel castings.*)

Sezione Ferriere, Piemontesi, Turin. (*Steel ingots, plates, sections, also seamless and welded tubes.*)

Sezione Industrie Metallurgiche, Turin. (*Steel forgings.*) (GENOA.)

Società Anonima Industriale Pietro Maria Ceretti, Villadossola, Genoa. (*Small steel castings, bars and sections.*) (GENOA.)

Società Anonima Italiana Tubi Togni, Cogoleto, Ligure, Italy. (*Welded tubes, masts and pillars.*) (GENOA.)

Società Anonima Nazionale "Cogne"—Miniere, Alti Forni, Impianti elettrici—Aosta, Italy. (Head Office, Turin.)

Società degli Alti Forni, Fonderie ed Acciaierie di Terni. (*Works* at Terni.) (NAPLES.)

Società Ilva Bagnoli, Bagnoli, Naples. (*Sections and bars.*) (NAPLES.)

Società Italiana Ernesto Breda, Sesto S. Giovanni, Milan, Italy. (*Sections, forgings, and castings.*) (GENOA.)

Società Siderurgica Togni, S.A., Brescia, Italy. (*Small bars and sections.*) (GENOA.)

Société Anonyme d'Angleur-Athus, Angleur, Grivegnée, Renory & Tilleur-lez-Liége, Belgium. (ANTWERP.)

Société Anonyme de Commentry-Fourchambault et Decazeville, Imphy (Nievre). (*Steel ingots, bars, sections, castings and forgings.*) (ST. ETIENNE.)

Société Anonyme d'Escaut & Meuse, Anzin (Nord), France. (ANTWERP.)

Société Anonyme de la Fabrique de Fer de Charleroi, Charleroi, Belgium. (*Rolling Mills.*) (ANTWERP.)

Société Anonyme de la Fabrique de Fer de Maubeuge, Louvroil (Nord), France. (*Steel ingots and plates.*) (ANTWERP.)

Société Anonyme des Aciéries de Famillereux, Famillereux, Belgium. (*Steel castings.*) (ANTWERP.)

Société Anonyme des Aciéries de France, Isbergues (Pas de Calais), France. (*Steel plates, blooms, bars and sections.*) (DUNKIRK.)

Société Anonyme des Aciéries de Haine St. Pierre et Lesquin, Haine St. Pierre, Belgium. (*Steel castings.*) (ANTWERP.)

Société Anonyme des Aciéries de la Meuse, Cheratte-lez-Liège, Belgium. (*Steel castings.*) (ANTWERP.)

Société Anonyme des Aciéries & Forges de Firminy, Firminy (Loire), France. (*Steel castings.*) (ST. ETIENNE.)

Société Anonyme des Aciéries ci-devant Georges Fischer, Schaffhouse, Switzerland. (*Steel castings.*) (WINTERTHUR.)

Société Anonyme des Aciéries Nantaises, Nantes. (*Steel castings.*) (NANTES.)

Société Anonyme des Aciéries Valère Mabille, Mariemont, Belgium. (*Small steel castings.*) (ANTWERP.)

Société Anonyme des Anciens Etablissements P.T. Roux, Marseilles. (*Steel castings.*) (MARSEILLES.)

Société Anonyme des Fonderies et Aciéries de Hirson, Hirson, France. (*Steel castings.*) (METZ.)

Société Anonyme des Forges de Vireux-Molhain, Vireux-Molhain, Ardennes, France. (*Plates, bars and sections.*) (ANTWERP.)

Société Anonyme des Forges et Aciéries de Dilling, Dillingen-Saar. (METZ.)

Société Anonyme des Forges et Aciéries de Huta-Bankowa, Dombrowa, Poland. (*Steel plates, sections and castings.*) (VIENNA.)

Société Anonyme des Forges et Fonderies de Montataire, Montataire, France. (PARIS.)

Société Anonyme des Forges et Laminoirs de Baume, Haine St. Pierre, Belgium. (*Rolling Mills for bars and sections.*) (ANTWERP.)

Société Anonyme des Forges et Tôleries Liégeoises, Jupille-lez-Liége. (ANTWERP.)

Société Anonyme des Forges, Usines & Fonderies de Haine St. Pierre, Haine St. Pierre, Belgium. (*Steel castings.*) (ANTWERP.)

Société Anonyme des Hauts-Fourneaux, Fonderies & Forges de Franche-Comté, Besançon (Doubs), France. (ST. ETIENNE.)

Société Anonyme des Hauts-Fourneaux, Forges & Aciéries de Denain et D'Anzin, Denain (Nord), France. (*Steel plates, round bars and steel castings.*) (ANTWERP.)

Société Anonyme des Laminoirs, Hauts-Fourneaux, Forges & Fonderies de la Providence, Hautmont (Nord), France. (ANTWERP.)

Société Anonyme des Laminoirs & Boulonneries du Ruau, Monceau-sur-Sambre, Belgium. (*Rolling Mills for Rivet bars.*) (ANTWERP.)

Société Anonyme des Usines de Fabrication de Tubes et de Forges de Sosnowice, Warsaw, Poland. (*Works* at Sosnowice and Zawiercie.) (*Plates, bars and sections; seamless and welded tubes.*) (VIENNA.)

Société Anonyme des Usines Gilson, La Croyère (Bois d'Haine), Belgium. (*Rolling Mills for sections.*) (ANTWERP.)

Société Anonyme d'Ougrée-Marihaye, Ougrée, near Liége, Belgium. (ANTWERP.)

Société Anonyme John Cockerill, Seraing, Belgium. (ANTWERP.)

Société Anonyme Usines & Aciéries Leonard-Giot, Marchienne-au-Pont, Belgium. (*Steel castings.*) (ANTWERP.)

Société des Aciéries de Longwy, Mont St. Martin (Meurthe & Moselle), France. (METZ.)

Société des Hauts-Fourneaux et Laminoirs de Montataire et de la Sambre, Hautmont (Nord), France. (*Steel plates, bars and sections.*) (ANTWERP.)

Société des Usines de Louis de Roll, Gerlafingen, Switzerland. (*Steel ingots, round bars and forgings.*) (WINTERTHUR.)

Société Française de Constructions Mécaniques (Anciens Etablissements Cail), Denain (Nord), France. (*Steel ingots, blooms, bars, sheets, castings and forgings.*) (ANTWERP.)

Société Française des Aciéries de Blanc-Misseron, Quièvrechain (Nord), France. (*Steel castings.*) (ANTWERP.)

Société Horme & Buire, Lyon. (*Steel castings.*) (ST. ETIENNE.)

Société Lorraine des Aciéries de Rombas, Rombas. (METZ.)

Société Métallurgique de Montbard-Aulnoye, Montbard. (Côte d'Or.) (*Steel ingots and forgings.*) (PARIS.)

Société Normande de Métallurgie, Mondeville (Calvados), France. (CAEN.)

Southern California Iron and Steel Co., Los Angeles, Cal., U.S.A. (*Round bars.*) (SAN FRANCISCO.)

Stabilimenti di Dalmine, Società Anonima, Dalmine (Bergamo). (*Weldless rolled or drawn steel tubes, hollow pillars and davits.*) (GENOA.)

Stahl und Walzwerk Hennigsdorf Aktiengesellschaft, Hennigsdorf, near Berlin. (*Steel castings and forgings.*) (STETTIN.)

Stahlwerk Gebr. Boehler, Akt. Ges., Düsseldorf-Oberkassel. (*Ingots for steel forgings.*) (DÜSSELDORF.)

Stahlwerk Mannheim Akt. Ges., Mannheim-Rheinau, Germany. (*Steel castings and forgings.*) (AUGSBURG.)

Stahlwerk "Mark" Act. Ges., Wengern-Ruhr, Germany. (*Steel castings.*) (DÜSSELDORF.)

Stahlwerk Oeking Act. Ges., Düsseldorf-Lierenfeld, Germany. (*Steel castings.*) (DÜSSELDORF.)

Statni Zelezarny a Ocelarny, Podbrezove, Czecho-Slovakia. (VIENNA.)

Stavanger Electro-Staalverk A.S., Stavanger, Norway. (*Steel castings.*) (OSLO.)

Steel & Tube Co. of America, Mark Plant, Indiana Harbor, Ind., U.S.A. (CHICAGO.)

Steel Company of Australia, Brunswick, Melbourne. (*Cast steel anchors.*) (MELBOURNE.)

Steel Company of Canada, Hamilton, Ontario. (*Works* at Hamilton and Belleville.) (TORONTO.) (*Works* at Montreal.) (MONTREAL.) (*Bars and angles.*)

Steirische Gussstahlwerke Act. Ges., Judenburg, Styria, Austria. (*Steel castings.*) (VIENNA.)

Sterling Steel Foundry Co., Braddock, Pa., U.S.A. (*Steel castings.*) (PITTSBURGH.)

Stora Kopparbergs Bergslags Aktiebolag, Falun, Sweden. (*Steel Works* at Domnarfvet.) (*Sections of all sizes and plates up to $\frac{3}{4}$ in. thick.*) (STOCKHOLM.)

Störch & Schöneberg Akt. Ges. für Bergbau & Hüttenbetrieb, Weidenau-Sieg, Abteilung Bremerhütte, Geisweid, Germany. (*Steel plates and ingots.*) (DÜSSELDORF.)

Strömmens Verksted, near Oslo. (*Steel castings.*) (OSLO.)

Strömsnäs Jernverks Aktiebolag, Degerfors, Sweden. (*Melting Furnaces and Rolling Mills.*) (GOTHENBURG.)

Strong Steel Foundry Co., Buffalo, N.Y., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

Sulzer Frères, Société Anonyme, Winterthur, Switzerland. (*Steel castings.*) (WINTERTHUR.)

Sumitomo Steel Tube and Copper Works, Lim., Amagasaki, Kobe, Japan. (*Ingots, small bars and sections; also weldless steel tubes.*) (KOBE.)

Sumitomo Steel Works, Osaka, Japan. (*Steel castings and forgings.*) (KOBE.)

Surahammars Bruks Aktiebolag, Surahammar, Sweden. (*Forge and Rolling Mills.*) (STOCKHOLM.)

Tata Iron & Steel Co., Lim., Jamshedpur, India. (*Steel plates, angles and channels.*) (CALCUTTA.)

Taylor-Wharton Iron & Steel Co., High Bridge, N.J., U.S.A. (*Steel castings.*) (NEW YORK.)

Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., U.S.A. (*Steel Works* at Ensley, Ala., and *Rolling Mills* at Bessemer and Fairfield, Ala.) (NEW ORLEANS, LA.)

Thomas Davidson Manufacturing Co. (The), Lim., Turcot, Montreal, Canada. (*Steel castings.*) (MONTREAL.)

Thompson & Co. (Castlemaine) Proprietary, Lim., Williamstown, Victoria. (*Steel castings.*) (MELBOURNE.)

Tokyo Kozai Kabushiki Kaisha. Tokyo Works (*Steel ingots, bars and sections*); Hirota Works (*Steel ingots*). (YOKOHAMA.)

Toledo Steel Casting Co., Toledo, O., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

Tosi (Franco), Legnano, Italy. (*Steel castings.*) (GENOA.)

Treadwell Engineering Co., Easton, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

Tremont Nail Co. (The), West Wareham, Mass., U.S.A. (*Steel ingots and forging billets.*) (BOSTON.)

Twin City Forge & Foundry Co., Stillwater, Minnesota, U.S.A. (*Steel castings.*) (CHICAGO.)

Uddeholms Aktiebolag, Uddeholm, Sweden. Nykroppa, Sweden. (*Steel ingots, forgings and bars.*) Storfors, Sweden. (*Weldless steel tubes.*) (STOCKHOLM.)

Union de Consommateurs de Produits Metallurgiques et Industriels, Usines d'Hagondange, Moselle. (*Steel blooms, billets, bars and sections.*) (METZ.)

Union des Aciéries, Société Anonyme, Marcinelle, Charleroi, Belgium. (*Steel castings.*) (ANTWERP).

Union Steel Casting Co., Pittsburgh, Pa., U.S.A. (*Steel castings.*) (PITTSBURGH.)

Uraga Dock Co., Lim., Uraga, Japan. (*Steel castings.*) (YOKOHAMA.)

Usinele de Fer si Domeni i Le Din, Resita, Societatea Anonima, Timisoara-Bucuresti. (BRAILA.)

Usines & Aciéries Allard, Société Anonyme, Mont-sur-Marchienne, near Charleroi, Belgium. (*Steel castings.*) (ANTWERP.)

Usines & Aciéries Allard, Société Anonyme, Turnhout, Belgium. (*Small steel castings.*) (ANTWERP.)

Usines Emile Henricot, Court St. Etienne, Belgium. (*Steel castings.*) (ANTWERP.)

Usines Gustave Boël (Aciéries de la Louvière), La Louvière, Belgium. (*Steel plates, sections, rivet bars and steel castings.*) (ANTWERP.)

Usines Métallurgiques de la Basse Loire, Trignac, near St. Nazaire. (NANTES.)

Usines Métallurgiques du Hainaut, Couillet, and La Louvière, Belgium. (*Steel Foundry and Rolling Mills.*) (ANTWERP.)

Van Tongelsche Stahlwerke G.m.b.H., Güstrow i. M., Germany. (*Steel castings.*) (HAMBURG.)

Vancouver Engineering Works, Lim., Vancouver, B.C. (*Steel castings.*) (VANCOUVER, B.C.)

Varde Staalvaerk, Varde, Denmark. (*Steel ingots and castings.*) (COPENHAGEN.)

Vereinigte Oberschlesische Hüttenwerke Aktiengesellschaft, Stahlwerke in Gleiwitz, Gleiwitz, Upper Silesia, Germany. (*Steel ingots, blooms, forgings and seamless tubes.*) (VIENNA.)

Vereinigte Stahlwerke Aktiengesellschaft, August Thyssen-Hütte, Dinslaken (Niederrhein), Germany. (*Weldless tubes, hollow pillars and masts.*) (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, August Thyssen-Hütte, Hamborn, Germany. (*Bars and sections only.*) (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, Bochumer-Verein, Bochum, Germany. (*Steel castings.*) (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, Charlottenhütte, Eichener Walzwerk, Kreuztal bei Siegen, Germany. (*Rolling Mills.*) (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, Charlottenhutte, Niederschelden (Sieg), Germany. (*Steel plates and ingots.*) (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, Concordiahütte, Bendorf, in Engers a. Rhein, Germany. (*Steel ingots and forgings.*) (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, Dortmunder Union-Hoerder Verein, Dortmund, Germany. (*Also steel castings.*) (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, Hütte Ruhrort-Meiderich, Duisburg-Meiderich, Germany. (*Bars and sections only.*) (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, Niederrheinische Hütte, Duisburg, Germany. (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, Rohrenwerke, Düsseldorf, Germany. (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, Stahl-und Walzwerke Thyssen, Mülheim-Ruhr, Germany. (DÜSSELDORF.)

Vereinigte Stahlwerke Aktiengesellschaft, Stahlwerke van der Zypen, Köln-Deutz, Germany. (*Bars and sections.*) (DÜSSELDORF.)

Vitkovice Zelezarny (Witkowitzer Bergbau & Eisenhütten-Gewerkschaft), Moravska Ostrava, 10, Czecho-Slovakia. (VIENNA.)

Walkers, Lim., Maryborough, Queensland. (*Steel castings.*) (BRISBANE.)

Walsh Island Government Dockyard, Newcastle, N.S.W. (*Steel castings.*) (NEWCASTLE, N.S.W.)

Warman Steel Casting Co., Los Angeles, Cal., U.S.A. (*Steel castings.*) (SAN FRANCISCO.)

Washington Iron Works, Seattle, Wash., U.S.A. (*Steel castings.*) (SEATTLE.)

Wellman-Seaver-Morgan Co., Cleveland, O., U.S.A. (*Steel castings.*) (CLEVELAND, O.)

Wendel, les Petits Fils de F. de, Hayange, Lorraine. (METZ.)

West Coast Iron Co., 16th and Rhode Island Streets, San Francisco, Cal., U.S.A. (*Steel ingots for forgings.*) (SAN FRANCISCO.)

Western Crucible Steel Casting Co., Minneapolis, Minn., U.S.A. (*Steel castings.*) (CHICAGO.)

Wharton, William, Jr., & Co., Inc., Easton, Pa., U.S.A. (*Steel castings.*) (PHILADELPHIA.)

Wheeling Mold & Foundry Co., Wheeling, W.Va., U.S.A. (*Steel castings.*) (PITTSBURGH.)

Worth Steel Co., Claymont, Del., U.S.A. (*Steel plates.*) (PHILADELPHIA.)

Youngstown (The) Sheet & Tube Co., Youngstown, O., U.S.A. (PITTSBURGH.)

Zelazohurt (Vereinigte Königs- & Laurahütte), Katowice, Poland. Krolewska Huta (Königshütte). (*Steel plates, angles, bars and forgings.*) Huta Laura (Laurahütte). (*Steel plates, angles, bars and weldless tubes.*) (VIENNA.)

FIRMS IN COUNTRIES OTHER THAN GREAT BRITAIN AND IRELAND.

ARRANGED ACCORDING TO SURVEYING DISTRICTS.

AMSTERDAM.

N.V. Machinefabriek G. Dikkers & Co., Hengelo, Holland. (*Small steel castings.*)

ANTWERP.

Aciéries de Mons, Nimy, Belgium. (*Small steel castings.*)

Aciéries de Sambre et Meuse, Jeumont (Nord), France. (*Steel castings.*)

Aciéries et Ateliers de Grosse Forge, Maurice Dembiermont & Cie., Hautmont (Nord), France. (*Steel forgings.*)

Baume & Marpent, Société Anonyme, Haine St. Pierre, Belgium. (*Small steel castings.*)

Compagnie des Forges et Aciéries de la Marine et d'Homécourt, Hautmont (Nord), France. (*Rolling Mills for bars and sections.*)

Compagnie Générale des Aciers, Société Anonyme, Thy-le-Chateau, Belgium. (*Steel castings.*)

Forges et Laminoirs de Saint Victor, Société Anonyme, Monceau-sur-Sambre, Belgium. (*Steel ingots.*)

Société Anonyme d'Angleur-Athus, Angleur, Grivegnée, Renory & Tilleur-lez-Liége, Belgium.

Société Anonyme d'Escaut & Meuse, Anzin (Nord), France.

Société Anonyme de la Fabrique de Fer de Charleroi, Charleroi, Belgium. (*Rolling Mills.*)

Société Anonyme de la Fabrique de Fer de Maubeuge, Louvroil (Nord), France. (*Steel ingots and plates.*)

Société Anonyme des Aciéries de Famillereux, Famillereux, Belgium. (*Steel castings.*)

Société Anonyme des Aciéries de Haine St. Pierre et Lesquin, Haine St. Pierre, Belgium. (*Steel castings.*)

Société Anonyme des Aciéries de la Meuse, Cheratte-lez-Liège, Belgium. (*Steel castings.*)

Société Anonyme des Aciéries Valère Mabille, Mariemont, Belgium. (*Small steel castings.*)

Société Anonyme des Forges de Vireux-Molhain, Vireux-Molhain, Ardennes, France. (*Plates, bars and sections.*)

Société Anonyme des Forges et Laminoirs de Baume, Haine St. Pierre, Belgium. (*Rolling Mills for bars and sections.*)

Société Anonyme des Forges et Tôleries Liégeoises, Jupille-lez-Liége, Belgium.

Société Anonyme des Forges, Usines & Fonderies de Haine St. Pierre, Haine St. Pierre, Belgium. (*Steel castings.*)

Société Anonyme des Hauts-Fourneaux, Forges & Aciéries de Denain et D'Anzin, Denain (Nord), France. (*Steel plates, round bars and steel castings.*)

ANTWERP—*continued.*

Société Anonyme des Laminoirs, Hauts-Fourneaux, Forges & Fonderies de la Providence, Hautmont (Nord), France.

Société Anonyme des Laminoirs & Boulonneries du Ruau, Monceau-sur-Sambre, Belgium. (*Rolling Mills for Rivet bars.*)

Société Anonyme d'Ougrée-Marihaye, Ougrée, near Liége, Belgium.

Société Anonyme des Usines Gilson, La Croyère (Bois d'Haine), Belgium. (*Rolling Mills for sections.*)

Société Anonyme John Cockerill, Seraing, Belgium.

Société Anonyme Usines & Aciéries Leonard-Giot, Marchienne-au-Pont, Belgium. (*Steel castings.*)

Société des Hauts Fourneaux et Laminoirs de Montataire et de la Sambre, Hautmont (Nord), France. (*Steel plates, bars and sections.*)

Société Française de Constructions Mécaniques (Anciens Etablissements Cail), Denain (Nord), France. (*Steel ingots, blooms, bars, sheets, castings and forgings.*)

Société Française des Aciéries de Blanc-Misseron, Quièvrechain (Nord), France. (*Steel castings.*)

Union des Aciéries, Société Anonyme, Marcinelle Charleroi, Belgium. (*Steel castings.*)

Usines & Aciéries Allard, Société Anonyme, Mont-sur-Marchienne, near Charleroi, Belgium. (*Steel castings.*)

Usines & Aciéries Allard, Société Anonyme, Turnhout, Belgium. (*Small steel castings.*)

Usines Emile Henricot, Court St. Etienne, Belgium. (*Steel castings.*)

Usines Gustave Boël (Aciéries de la Louvière), La Louvière, Belgium. (*Steel plates, sections, rivet bars and steel castings.*)

Usines Métallurgiques du Hainaut, Couillet and La Louvière, Belgium. (*Steel Foundry and Rolling Mills.*)

AUGSBURG.

Maschinenfabrik Augsburg-Nürnberg A.G., Augsburg Germany. (*Steel forgings.*)

Stahlwerk Mannheim Akt. Ges., Mannheim-Rheinau, Germany. (*Steel castings and forgings.*)

BALTIMORE, MD.

Bethléhem Steel Co.
Lebanon, Pa., U.S.A. (*Rolling Mills for bars.*)
Sparrow's Point, Md., U.S.A.
Steelton, Pa., U.S.A.

Central Iron & Steel Co., Harrisburg, Pa., U.S.A. (*Rolling Mills.*)

BILBAO.

Compañia Anonima Basconia, Bilbao.

Compañia Fabrica de Trubia, Trubia Asturias, Spain. (*Steel castings and forgings.*)

Sociedad Altos Hornos de Vizcaya, Bilbao.

Sociedad Anonima Aceros de Elorrieta, Bilbao. (*Steel castings.*)

Sociedad Anonima Fabrica de Mieres, Ablaña, Asturias, Spain.

Sociedad Anonima Fabrica de San Francisco del Desierto, Bilbao.

Sociedad Anonima Industrial Asturiana, Fabricas de Moreda y Gijon, Gijon. (*Rivet bars.*)

Sociedad Anonima Jose Maria Quijano, Forjas de Los Corrales de Buelna, Provincia de Santander, Spain. (*Steel bars.*)

Sociedad Anonima Talleres de Deusto, Deusto, Bilbao. (*Steel castings.*)

Sociedad Española de Construccion Naval, Reinosa, near Santander, Spain. (*Steel castings and forgings.*)

Sociedad Metalurgica Duro-Felguera, La Felguera, Asturias, Spain.

BORDEAUX.

Compagnie des Forges et Aciéries de la Marine et d'Homécourt, Le Boucau (Forges de l'Adour), (Basses-Pyrénées), France. (*Bars and sections.*)

BOSTON.

Roxbury Steel Casting Co., Boston, Mass., U.S.A. (*Steel castings.*)

Tremont Nail Co. (The), West Wareham, Mass., U.S.A. (*Steel ingots and forging billets.*)

BRAILA.

Usinele de Fer si Domeni i le Din, Resita, Societatea Anonima, Timisoara-Bucuresti.

BREMEN.

Atlas-Werke Akt. Ges., Bremen. (*Steel castings.*)

Deutsche Schiff und Maschinenbau Aktiengesellschaft, Werk Act. Ges. "Weser," Bremen, Germany. (*Small steel castings.*)

Lindener Eisen & Stahlwerke Akt. Ges., Hannover-Linden, Germany. (*Steel castings.*)

BRISBANE.

Walkers, Lim., Maryborough, Queensland. (*Steel castings.*)

CAEN.

Société Normande de Métallurgie, Mondeville (Calvados), France.

CALCUTTA.

Tata Iron & Steel Co., Lim., Jamshedpur, India. (*Steel plates, angles and channels.*)

CHICAGO, ILL.

American Steel Foundries, Indiana Harbor, Ind., U.S.A. (*Steel castings.*)

Colorado (The) Fuel & Iron Co., Minnequa Works, Pueblo, Colo. (*Bars and small sections.*)

Falk Corporation, Milwaukee, Wis., U.S.A. (*Steel castings.*)

Finkl (A.) & Sons Company, Chicago, Ill., U.S.A. (*Steel forgings.*)

Hubbard Steel Foundry Co., East Chicago, Ind., U.S.A. (*Steel castings.*)

Huntington Steel Co., Huntington, Ind., U.S.A. (*Steel castings.*)

Illinois Steel Co., Chicago, Ill., U.S.A.

Inland Steel Co. (*Steel Works* at Indiana Harbor, Ind., U.S.A., and *Rolling Mills* at Chicago Heights, Chicago, Ill., U.S.A.)

Interstate Iron and Steel Co., Chicago, Ill., U.S.A. (*Steel Works* at 118th Street, Chicago, and *Rolling Mills* at East Chicago, Ind.) (*Steel angles and bars.*)

Maynard Electric Steel Castings Co., Milwaukee, Wisconsin, U.S.A. (*Steel castings.*)

National Enameling & Stamping Co., Granite City, Ill., U.S.A.

National Malleable and Steel Castings Co., Melrose Park, Chicago, Ill., U.S.A. (*Steel ingots.*)

National Steel Foundries Co., Milwaukee, Wis., U.S.A. (*Steel castings.*)

Northwestern Steel and Iron Corporation, Minneapolis. Minn., U.S.A. (*Steel castings.*)

Pelton Steel Co., Milwaukee, Wis., U.S.A. (*Steel castings.*)

Railway Steel Spring Co., Chicago Heights, Ill., U.S.A. (*Steel ingots.*)

Scullin Steel Co., St. Louis, Mo., U.S.A. (*Steel castings.*)

Steel & Tube Co. of America, Mark Plant, Indiana Harbor, Ind., U.S.A.

Twin City Forge and Foundry Co., Stillwater, Minnesota, U.S.A. (*Steel castings.*)

Western Crucible Steel Casting Co., Minneapolis, Minn., U.S.A. (*Steel castings.*)

CLEVELAND, O.

American Rolling Mill Co., Middletown, O., U.S.A. (*Steel castings and forgings.*)

Andrews Steel Co., Newport, Kentucky, U.S.A. (*Ingots, blooms, billets and slabs.*)

Atlas Steel Casting Co., Buffalo, N.Y., U.S.A. (*Steel castings.*)

Bethlehem Steel Co., Buffalo, N.Y., U.S.A.

Bourne Fuller Co., Cleveland, O., U.S.A. (*Round and square steel bars.*)

CLEVELAND, O.—*continued.*

Buhl Malleable Co., Detroit, Mich., U.S.A. (*Steel castings.*)

Canada Foundries & Forgings, Lim., Welland, Ontario. (*Steel forgings.*)

Canton Steel Foundry Co., Canton, O., U.S.A. (*Steel castings and ingots.*)

Central Alloy Steel Corporation, Massillon, O., U.S.A.

Cleveland Steel Casting Co., Cleveland, O., U.S.A. (*Steel castings.*)

Corrigan, McKinney & Co., Cleveland, O., U.S.A. (*Steel ingots, blooms and billets.*)

Detroit Steel Casting Co., Detroit, Mich., U.S.A. (*Steel castings.*)

Donner Steel Co., Inc. (The), Buffalo, N.Y., U.S.A.

Electric Steel & Metals Co., Lim., Welland, Ontario. (*Steel ingots and steel castings.*)

Erie Forge Co., Erie, Pa., U.S.A. (*Steel ingots, forgings and castings.*)

Gould-Coupler Co., Depew, N.Y., U.S.A. (*Steel ingots.*)

Industrial Steel Castings Co., Toledo, O., U.S.A. (*Steel castings.*)

Michigan Steel Casting Co., Detroit, Mich., U.S.A. (*Small castings.*)

Monarch Steel Castings Co., Detroit, Mich., U.S.A. (*Steel castings.*)

National Erie Co., Erie, Pa., U.S.A. (*Steel castings.*)

National Tube Co., Lorain, O., U.S.A. (*Blooms, billets and plates.*)

Ohio Steel Foundry Co., Lima, O., U.S.A.

Otis Elevator Co., Buffalo, N.Y., U.S.A. (*Steel castings.*)

Otis Steel Co. (The), Cleveland, O., U.S.A.

Strong Steel Foundry Co., Buffalo, N.Y., U.S.A. (*Steel castings.*)

Toledo Steel Casting Co., Toledo, O., U.S.A. (*Steel castings.*)

Wellman-Seaver-Morgan Co., Cleveland, O., U.S.A. (*Steel castings.*)

COLUMBUS, O.

Bonney-Floyd Co., Columbus, O., U.S.A. (*Steel castings.*)

COPENHAGEN.

Burmeister & Wain's Maskin-og Skibsbyggeri, Aktieselskabet, Copenhagen. (*Steel ingots, forgings and castings.*)

Varde Staalvaerk, Varde, Denmark. (*Steel ingots and castings.*)

DANZIG.

Schichau, F., Elbing, West Prussia, Germany. (*Steel castings.*)

DUNKIRK.

Aciéries de Haine St. Pierre & Lesquin, Lesquin-lez-Lille (Nord), France. (*Steel castings.*)

Aciéries de Paris et d'Outreau, Outreau (Pas de Calais), France. (*Steel castings.*)

Compagnie de Fives Lille, Société Anonyme, Fives Lille (Nord), France. (*Steel ingots, castings and forgings.*)

Société Anonyme des Aciéries de France, Isbergues (Pas de Calais), France. (*Steel plates, blooms, bars and sections.*)

DÜSSELDORF.

Bergische Stahl-Industrie Kommanditgesellschaft, Remscheid, Germany. (*Steel ingots and castings.*)

Eisen-und Stahlwerk Hoesch, Dortmund, Germany. (*Rolling Mills.*)

Geisweider Eisenwerke Act. Ges., Geisweid (Kreis Siegen), Germany. (*Rolling Mills.*)

Grafenberger Walzwerk G.m.b.H., Düsseldorf-Grafenberg, Germany. (*Rolling Mills.*)

Gruson (Otto) & Co., Eisen und Stahlwerk, Magdeburg-Buckau, Germany. (*Steel castings.*)

Gusstahlwerk Wittmann Aktiengesellschaft, Haspe, near Hagen, Westphalia, Germany. (*Steel castings.*)

Gutehoffnungshütte Oberhausen Aktiengesellschaft, Oberhausen, Rheinland, Germany. (*Also Steel castings.*)

Gutehoffnungshütte, Abteilung Haniel & Lueg, Düsseldorf-Grafenberg, Germany. (*Steel castings.*)

Hahnsche Werke Act. Ges., Grossenbaum, near Duisburg, Germany. (*Broad flats and ingots.*)

Hüttengesellschaft der Rothen Erden, Aachen Rothe Erde, Germany. (*Rolling Mills.*)

Jaeger, G. & J., Kommandit Ges., Elberfeld, Germany. (*Steel castings.*)

Klöckner-Werke A. G., Abteilung Eisen-und Draht-Industrie, Düsseldorf-Oberbilk, Germany. (*Bars and sections only.*)

Klöckner-Werke A. G., Abteilung Georgs-Marien-Werke, Osnabrück, Germany. (*Steel castings.*)

Klöckner-Werke A. G., Abteilung Hasper Eisen-und Stahlwerk, Haspe, Westphalia, Germany. (*Rolling Mills.*)

Klöckner-Werke A.G., Abteilung Mannstaedtwerke, Troisdorf, near Cologne, Germany. (*Rolling Mills for Sections.*)

Krautheim (G.), Aktiengesellschaft, Chemnitz-Borna, Germany. (*Steel castings.*)

Krupp, Fried., Act. Ges., Stahlwerk Annen in Annen, Westphalia, Germany. (*Steel castings.*)

Krupp, Fried., Act. Ges., Essen, Germany. (*Also steel castings.*)

Krupp, Fried., Act. Ges., Grusonwerk, Magdeburg, Germany. (*Steel castings.*)

DÜSSELDORF—*continued.*

Krupp, Fried. Act. Ges.-Friedrich Alfred Hütte, Rheinhausen-Friemersheim, Germany. (*Bars and Sections only.*)

Mannesmannröhrenwerke, Abteilung Grillo Funke, Gelsenkirchen-Schalke, Westphalia, Germany.

Mannesmannröhrenwerke, Abteilung Schulz Knaudt, Hückingen, Germany. (*Steel Works and Rolling Mills.*)

Mannesmannröhrenwerke, Düsseldorf and Remscheid, Germany. (*Weldless rolled or drawn steel hollow pillars and davits.*)

Mitteldeutsche Stahlwerke Akt. Ges., Lauchhammerwerk Gröditz, Gröditz, Germany. (*Steel castings.*)

Mitteldeutsche Stahlwerke Akt. Ges., Lauchhammerwerk Riesa, Riesa, Germany. (*Rolling Mills.*)

Press & Walzwerk Akt. Ges., Reisholz near Dusseldorf. Abteilung Oberbilker Stahlwerk, Düsseldorf-Oberbilk, Germany.

Rheinische Metallwaaren und Maschinenfabrik, Düsseldorf, Germany. (*Steel ingots and forgings and weldless steel tubes.*)

Ruhrstahl Aktiengesellschaft, Annener Gussstahlwerk, Witten-Annen, near Dortmund, Westphalia, Germany. (*Steel castings.*)

Ruhrstahl Aktiengesellschaft, Gelsenkirchener Gussstahlwerke, Gelsenkirchen, Germany. (*Steel castings.*)

Ruhrstahl Aktiengesellschaft Gussstahlwerk Witten, Witten, Germany.

Ruhrstahl Aktiengesellschaft Henrichshütte, Hattingen, Germany.

Ruhrstahl Aktiengesellschaft, Stahlwerk Krieger, Düsseldorf, Germany. (*Steel castings.*)

Sächsische Gussstahlwerke Döhlen Aktiengesellschaft, Döhlen, near Dresden, Saxony. (*Steel ingots and forgings.*)

Schäffer & Budenburg G.m.b.H., Magdeburg-Buckau, Germany. (*Small steel castings.*)

Stahlwerk Gebr. Boehler, Act. Ges., Düsseldorf-Oberkassel. (*Ingots for steel forgings.*)

Stahlwerk "Mark" Act. Ges., Wengern-Ruhr, Germany. (*Steel castings.*)

Stahlwerk Oeking Act. Ges., Düsseldorf-Lierenfeld, Germany. (*Steel castings.*)

Storch & Schöneberg Akt. Ges. für Bergbau & Hüttenbetrieb, Weidenau-Sieg, Abteilung Bremerhütte, Geisweid, Germany. (*Steel plates and ingots.*)

Vereinigte Stahlwerke Aktiengesellschaft, August Thyssen-Hütte, Dinslaken (Niederrhein), Germany. (*Weldless tubes, hollow pillars and masts.*)

Vereinigte Stahlwerke Aktiengesellschaft, August Thyssen-Hütte, Hamborn, Germany. (*Bars and sections only.*)

Vereinigte Stahlwerke Aktiengesellschaft, Bochumer Verein, Bochum, Germany. (*Steel castings.*)

Vereinigte Stahlwerke Aktiengesellschaft, Charlottenhütte, Eichener Walzwerk, Kreuztal bei Siegen, Germany. (*Rolling Mills.*)

DÜSSELDORF—*continued.*

Vereinigte Stahlwerke Aktiengesellschaft, Charlottenhütte, Niederschelden (Sieg), Germany. (*Steel plates and ingots.*)

Vereinigte Stahlwerke Aktiengesellschaft, Concordiahütte, Bendorf, in Engers a. Rhein, Germany. (*Steel ingots and forgings.*)

Vereinigte Stahlwerke Aktiengesellschaft, Dortmunder Union-Hoerder Verein, Dortmund, Germany. (*Also steel castings.*)

Vereinigte Stahlwerke Aktiengesellschaft, Hütte Ruhrort-Meiderich, Duisburg-Meiderich, Germany. (*Bars and sections only.*)

Vereinigte Stahlwerke Aktiengesellschaft, Niederrheinische Hütte, Duisburg, Germany.

Vereinigte Stahlwerke Aktiengesellschaft, Röhrenwerke, Düsseldorf, Germany.

Vereinigte Stahlwerke Aktiengesellschaft, Stahl-und Walzwerke Thyssen, Mülheim-Ruhr, Germany.

Vereinigte Stahlwerke Aktiengesellschaft, Stahlwerke van der Zypen, Köln-Deutz, Germany. (*Bars and sections.*)

GENOA.

Acciaieria & Ferriere del Caleotto, Castello Sopra Lecco, Italy. (*Steel bars and small sections.*)

Acciaieria Danieli & Co., Brescia, Italy. (*Steel castings.*)

Acciaierie & Ferriere Lombarde ; Head office, Milan. (Works at Milan, *weldless rolled or drawn steel tubes and hollow pillars.*) (Works at Sesto S. Giovanni, *bars, sections, steel castings, and steel plates.*)

Esercizio Fonderie Filut, Torino, Italy ; Head Office in Turin. (Works at Susa and Rivoli-Vica.) (*Steel castings.*)

Ferriera di Bolzaneto, near Genoa. (*For plates up to $\frac{3}{4}$ in. thickness.*)

Ferriere di Voltri, Voltri, Italy. (*Small sections, angles and bars.*)

Fonderia Milanese di Acciaio Vanzetti, Milan. (*Steel castings.*)

Ilva Alti Forni e Acciaierie d'Italia, Genoa.

Stabilimento di Pra, Pra.
Stabilimento di Bolzaneto, Bolzaneto.
Stabilimento di Sestri Ponente, Sestri Ponente.
Stabilimento di Savona, Savona.

Società Alti Forni, Fonderie, Acciaierie e Ferriere, Franchi-Gregorini, Forno d'Allione (Val Camonica), Italy. (*Steel ingots.*)

Società Alti Forni, Fonderie, Acciaierie e Ferriere, Franchi-Gregorini, Lovere, Italy. (*Bars and sections, castings and forgings.*)

Società Alti Forni e Acciaierie d'Italia, Porto Vecchio di Piombino, Italy. (*Sections and bars.*)

Società Anonima Acciaierie Elettriche di Sesto San Giovanni, Sesto San Giovanni, Milan, Italy. (*Steel castings.*)

GENOA—*continued.*

Società Anonima Ansaldo, Acciaierie e Fonderie di Acciaio, Cornigliano Ligure, Italy. (*Steel ingots, forgings, castings, plates and sections.*

Società Anonima Ferriere di Voltri, Stabilimenti di Oneglia e Portomaurizio, Oneglia, Italy. (*Sections and bars.*)

Società Anonima FIAT,

Sezione Acciaierie, Turin. (*Steel castings.*)

Sezione Ferriere, Piemontesi, Turin. (*Steel ingots, plates, sections, also seamless and welded tubes.*)

Sezione Industrie Metallurgiche, Turin. (*Steel forgings.*)

Società Anonima Industriale Pietro Maria Ceretti, Villadossola, Genoa. (*Small steel castings, bars and sections.*)

Società Anonima Italiana Tubi Togni, Cogoleto, Ligure, Italy. (*Welded tubes, masts and pillars.*)

Società Anonima Nazionale "Cogne" Miniere, Alti Forni, Impianti elettrici, Aosta, Italy. (*Head Office, Turin.*)

Società Italiana Ernesto Breda, Sesto S. Giovanni, Milan, Italy. (*Sections, forgings and castings.*)

Società Siderurgica Togni, S.A., Brescia, Italy. (*Small bars and sections.*)

Stabilimenti di Dalmine, Società Anonima, Dalmine (Bergamo). (*Weldless rolled or drawn steel tubes, hollow pillars and davits.*)

Tosi (Franco), Legnano, Italy. (*Steel castings.*)

GOTHENBURG.

Aktiebolaget Bofors, Bofors, Sweden. (*Melting Furnaces and Foundry* at Bofors.)

Aktiebolaget Lindholmen-Motala, Motala Verkstad, Sweden. (*Melting Furnaces, Rolling Mills and Forge.*)

Björneborgs Jernverks Aktiebolag, Björneborg, Sweden. (*Melting Furnaces and Forge.*)

Nydqvist & Holm Aktiebolag, Trollhättan, Sweden. (*Steel castings.*)

Strömsnäs Jernverks Aktiebolag, Degerfors, Sweden. (*Melting Furnaces and Rolling Mills.*)

HAKODATE.

The Japan Steel Works, Lim., Muroran, Japan. (*Steel ingots, forgings and castings.*)

HALIFAX, N.S.

Cumming (J. W.) Manufacturing Co., Lim., New Glasgow, Nova Scotia. (*Small steel castings.*)

Dominion Iron & Steel Co., Lim., Sydney, Nova Scotia. (*Steel ingots, billets, plates and sections.*)

Nova Scotia Steel & Coal Co., Lim. (*Steel Works* at North Sydney, C.B., and *Rolling Mills* at New Glasgow, N.S.) (*Bars and sections only.*)

HAMBURG.

Blohm & Voss, Hamburg, Germany. (*Steel castings.*)

Deutsche Werke A.G., Kiel, Germany. (*Steel castings.*)

Michaelsen, Hermann, Eisen-und Stahl-Giesserei, Erdmannstrasse, 23, Altona-Ottensen, Germany. (*Steel castings.*)

Niemeyer, Georg, Metall, Stahl-und Eisenwerke, Harburg a. d. Elbe, Germany. (*Steel castings.*)

Nordische Stahlwerke, Bach & Co. Kommanditgesellschaft, Neumünster, Germany. (*Small steel castings.*)

Van Tongelsche Stahlwerke G.m.b.H., Güstrow i. M., Germany. (*Steel castings.*)

HANKOW.

Han-Yeh-Ping Iron & Coal Co., Lim., Hanyang, China,

HELSINGFORS.

Aktiebolaget Dalsbruk, Dalsbruk, Finland. (*Steel ingots, forgings, castings, bars and angles.*)

KOBE.

Hamuro Foundry Co., Osaka, Japan. (*Steel castings.*)

Kawasaki Dockyard Co., Lim. (Fukiai Works), Kobe, Japan.

Kawasaki Sharyo Kabushiki Kaisha, Shiri-ike-mura, Hiogo, Japan. (*Steel castings, forgings, bars and sections.*)

Kobe Steel Works, Lim., Kobe, Japan. (*Steel castings, forgings, and plain and angle bars of small section.*)

Miki Cast Steel Works, Lim., Osaka, Japan. (*Small steel castings.*)

Mitsu Bishi Seitetsu Kabushiki Kaisha, Kenjiho, Korea.

Nippon Steel Foundry, Lim., Osaka, Japan. (*Steel castings.*)

Osaka Chain Works, Lim., Osaka, Japan. (*Small steel castings.*)

Sumitomo Steel Tube & Copper Works Lim., Amagasaki, Kobe, Japan. (*Ingots, small bars and sections; also weldless steel tubes.*)

Sumitomo Steel Works, Osaka, Japan. (*Steel castings and forgings.*)

MALMÖ.

Aktiebolaget Abjörn Anderson, Svedala, near Malmö, Sweden. (*Steel castings.*)

MARSEILLES.

Compagnie des Mines, Fonderies & Forges d'Alais, Tamaris Works, Alais, France. (*Bars and sections.*)

Compagnie des Mines, Fonderies & Forges d'Alais, Marseilles. (*Steel castings.*)

Fonderies d'Acier du Midi, Marseilles. (*Steel castings.*)

Société Anonyme des Anciens Etablissements P.T. Roux, Marseilles. (*Steel castings.*)

MELBOURNE.

Ruwolt (Charles) Proprietary, Lim., Richmond, Melbourne. (*Steel castings.*)

Steel Company of Australia, Brunswick, Melbourne. (*Cast steel anchors.*)

Thompson & Co. (Castlemaine), Proprietary, Lim., Williamstown, Victoria. (*Steel castings.*)

METZ.

Aciéries & Usines a Tubes de la Sarre, Division Aciéries, Sarrebrück-Burbach. (*Steel castings.*)

Aciéries Réunies de Burbach-Eich-Dudelange (Arbed). Works at Burbach and Hostenbach, Saarbrucken-Burbach; and Dommeldange, Luxembourg. (*Steel ingots, castings and forgings.*)

Compagnie des Forges et Aciéries de la Marine et d'Homécourt, Homécourt (Meurthe & Moselle).

Edelstahlwerk Rochling A.G., Volklingen a.d. Saar. (*Steel ingots, billets, bars and forgings.*)

Hauts-Fourneaux, Fonderies, Forges & Laminoirs de Meurthe & Moselle (Mr. Fould-Dupont), Usines de Pompey, France.

Mannesmannröhrenwerke, Bous.

Société Anonyme des Fonderies et Aciéries de Hirson, Hirson, France. (*Steel castings.*)

Société Anonyme des Forges et Aciéries de Dilling, Dillingen-Saar.

Société des Aciéries de Longwy, Mont St. Martin (Meurthe & Moselle), France.

Société Lorraine des Aciéries de Rombas, Rombas.

Union de Consommateurs de Produits Métallurgiques et Industriels, Usines d'Hagondange, Moselle. (*Steel blooms, billets, bars and sections.*)

Wendel, les Petits Fils de F. de, Hayange, Lorraine.

MONTREAL.

Canadian Steel Foundries, Lim., Longue Pointe, Montreal. (*Steel castings.*)

Steel Company of Canada, Hamilton, Ontario. (*Works* at Montreal.) (*Bars and angles.*)

Thomas Davidson Manufacturing Co.(The), Lim., Turcot, Montreal. (*Steel castings.*)

NAGASAKI.

Asano Kokura Steel Co., Lim., Konomimachi, Kokura, Japan. (*Ingots.*)

Imperial Steel Works, The, Yawata, Japan.

Mitsu Bishi Dockyard & Engine Works, Nagasaki Japan. (*Steel castings.*)

Mitsubishi Zosen Kaisha, Nagasaki Steel Works, Urakami, Nagasaki, Japan. (*Steel ingots, blooms and forgings.*)

NANTES.

Etablissements J. J. Carnaud and Forges de Basse-Indre, Basse-Indre, Loire-Inférieure. (*Also steel castings.*)

Société Anonyme des Aciéries Nantaises, Nantes. (*Steel castings.*)

Usines Métallurgiques de la Basse Loire, Trignac, near St. Nazaire.

NAPLES.

Ferriere ed Acciaierie del Vesuvio, Torre Annunziata, Naples. (*Rolling Mills for sections and bars.*)

Ilva Alti Forni e Acciaierie d'Italia, Stabilimento di Bagnoli, Bagnoli. (*Sections and bars.*)

Società degli Alti Forni, Fonderie ed Acciaierie di Terni. (*Works* at Terni.)

Società Ilva Bagnoli, Bagnoli, Naples. (*Sections and bars.*)

NEW ORLEANS, LA.

American Machine & Manufacturing Co., Atlanta, Ga., U.S.A. (*Steel castings.*)

Anniston Electric Steel Corporation, Anniston, Ala., U.S.A. (*Steel castings and rivet bars.*)

Gulf States Steel Co., Alabama City, Ala., U.S.A. (*Rivet and stay bars up to $2\frac{1}{2}$ ins. diameter.*)

Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., U.S.A. (*Steel Works* at Ensley, Ala., and *Rolling Mills* at Bessemer and Fairfield, Ala.)

NEW YORK.

Adirondacks Steel Foundries Corporation, Watervliet, N.Y., U.S.A. (*Steel castings.*)

Bayonne Steel Casting Co., Bayonne, N.J., U.S.A. (*Steel castings.*)

Chrome Steel Works, Cartaret, New Jersey, U.S.A. (*Steel castings.*)

Eastern Steel Castings Co., Newark, N.J., U.S.A. (*Steel castings.*)

Malleable Iron Fittings Co., Branford, Conn., U.S.A. (*Steel castings.*)

New Jersey Steel Co., Rahway, N.J., U.S.A. (*Steel castings.*)

Riverside Steel Casting Co., Kearny, N.J., U.S.A. (*Steel castings.*)

Taylor-Wharton Iron & Steel Co., High Bridge, N.J., U.S.A. (*Steel castings.*)

NEWCASTLE, N.S.W.

Broken Hill Proprietary Co., Lim., Iron and Steel Works, Newcastle, N.S.W. (*Steel plates, bars, sections and castings.*)

Commonwealth Steel Products Co., Lim., Waratah, Newcastle, N.S.W. (*Steel castings and forgings.*)

Walsh Island Government Dockyard, Newcastle, N.S.W. (*Steel castings.*)

NEWPORT NEWS, VA.

Newport News Shipbuilding & Dry Dock Co., Newport News, Va., U.S.A. (*Steel castings and forgings.*)

OSLO.

Drammens Jernstoberi A/S., Drammen, Norway. (*Small steel castings.*)

Raufoss Ammunisjonsfabrikker, Raufoss, Norway. (*Steel castings.*)

Stavanger Electro-Staalverk A/S., Stavanger, Norway. (*Steel castings.*)

Strömmens Verksted, near Oslo. (*Steel castings.*)

PARIS.

Aciéries de Gennevilliers, Gennevilliers, near Paris. (*Small steel castings.*)

Aciéries de Grenelle (E. Plichon), 56, Rue Lourmel, Paris. (*Steel castings.*)

Aciéries de Nanterre, Société Anonyme, Nanterre (Seine), France. (*Steel castings.*)

Société Anonyme des Forges et Fonderies de Montataire, Montataire, France.

Société Metallurgique de Montbard-Aulnoye, Montbard. (Côte d'Or.) (*Steel ingots and forgings.*)

PHILADELPHIA, PA.

Alan Wood, Iron & Steel Company, Conshohocken and Ivy Rock, Pa., U.S.A. (*Blooms, billets and thin plates.*)

American Bridge Co., Pencoyd Iron Works, Pencoyd, Pa., U.S.A. (*Sections, angles and bars.*)

American Locomotive Co., Chester, Pa., U.S.A. (*Steel castings.*)

American Manganese Steel Co., Newcastle, Del., U.S.A. (*Steel castings.*)

American Steel Foundries, Chester, Pa., U.S.A. (*Steel castings.*)

Atlantic Steel Castings Co., Chester, Pa., U.S.A. (*Steel castings.*)

Bethlehem Steel Co., Bethlehem, Pa., U.S.A.; Reading, Pa., U.S.A. (*Rolling Mills for bars*); and Coatesville, Pa., U.S.A. (*Rolling Mills for plates and bars.*)

Birdsboro' Steel Foundry & Machine Co., Birdsboro', Pa., U.S.A. (*Steel castings and ingots.*)

Chester Steel Castings Co., Chester, Pa., U.S.A. (*Steel castings.*)

Crucible Steel Castings Company, Landsdowne, Pa., U.S.A. (*Steel castings.*)

Drain Steel Co., Moore, Pa., U.S.A. (*Steel ingots.*)

Eagan-Johnson Steel & Iron Co., Inc., Crum Lynne, Pa., U.S.A. (*Small steel castings.*)

Eastern Steel Company, Pottsville, Pa., U.S.A. (*Sections and bars.*)

Federal Steel Foundry Co., Chester, Pa., U.S.A. (*Steel castings.*)

Glasgow Iron Co., Pottstown, Pa., U.S.A. (*Rolling Mills for plates.*)

Luken's Steel Company, Coatesville, Pa., U.S.A.

Midvale Company, Philadelphia, Pa., U.S.A. (*Steel forgings.*)

PHILADELPHIA, PA.—*continued.*

Penn Steel Castings Co., Newcastle, Delaware, U.S.A.; Chester, Pa., U.S.A. (*Steel castings.*)

Pennsylvania Forge Co., Bridesburg, Philadelphia, Pa., U.S.A. (*Steel ingots and forgings.*)

Philadelphia Roll & Machine Co., Philadelphia, Pa., U.S.A. (*Steel castings.*)

Phœnix Iron Works, Phœnixville, Pa., U.S.A.

Reading Steel Casting Co., Reading, Pa., U.S.A. (*Small steel castings.*)

Treadwell Engineering Co., Easton, Pa., U.S.A. (*Steel castings.*)

Wharton, William, Jr., & Co., Inc., Easton, Pa., U.S.A. (*Steel castings.*)

Worth Steel Co., Claymont, Del., U.S.A. (*Steel plates.*)

PITTSBURGH, PA.

Allegheny Steel Co., Brackenridge, Pa., U.S.A. (*Also steel castings.*)

American Steel & Wire Co. (Shoenberger Works), Fifteenth Street, Pittsburgh, Pa., U.S.A. (*Steel ingots, etc.*)

Brier Hill Steel Co. (The), Youngstown, O., U.S.A.

Cambria Steel Co., Johnstown, Pa., U.S.A.

Carbon Steel Co., Pittsburgh, Pa., U.S.A.

Carnegie Steel Co., Pittsburgh, Pa., U.S.A.

Crucible Steel Company of America, Park Works, Pittsburgh, Pa., U.S.A.

Forged Steel Wheel Company, Butler, Pa., U.S.A.

Jones & Laughlin Steel Corporation, Pittsburgh, Pa., U.S.A.

La Belle Iron Works, Steubenville, O., U.S.A.

Mesta Machine Co., West Homestead, Pa., U.S.A. (*Steel ingots, castings and forgings.*)

National Malleable and Steel Castings Co., Sharon, Pa., U.S.A. (*Steel ingots.*)

Oliver Iron & Steel Co., Pittsburgh, Pa., U.S.A. (*Rolling Mills for bars.*)

Pittsburgh Crucible Steel Co., Midland, Pa., U.S.A.

Pittsburgh Steel Foundry, Glassport, Pa., U.S.A. (*Steel castings and ingots.*)

Republic Iron & Steel Co., Youngstown, O., U.S.A.

Sharon Steel Hoop Co., Youngstown, O. (*Steel melting plant* at Lowellville, O.; and *Rolling mills* at Youngstown, O.)

Sterling Steel Foundry Co., Braddock, Pa., U.S.A. (*Steel castings.*)

Union Steel Casting Co., Pittsburgh, Pa., U.S.A. (*Steel castings.*)

Wheeling Mold & Foundry Co., Wheeling, W. Va., U.S.A. (*Steel castings.*)

Youngstown (The) Sheet & Tube Co., Youngstown, O., U.S.A.

PORTLAND, OREGON.

Columbia Steel Co., Portland, Or., U.S.A. (*Steel castings.*)

Electric Steel Foundry, Portland, Or., U.S.A. (*Steel castings.*)

PRAGUE.

Ceskomoravska-Kolben, Prague. (*Steel castings.*)

Ignaz Storek, Brünn, Czecho-Slovakia. (*Steel castings.*)

Limited Co., formerly the Skoda-Works, Pilsen. (*Steel castings and forgings.*)

Mannesmannröhrenwerke, Komotau, Czecho-Slovakia. (*Weldless steel tubes.*)

Poldihütte Tiegelguss - stahlfabrik, Kladno, near Prague.

Prazska zelezarska spolecnost, Kladno, near Prague.

ROTTERDAM.

Machine Fabriek Yzer-Staal & Metaal Gieterij (v/h Bakker & Co.) Ridderkerk. (*Steel castings.*)

Nederlandsche Staalfabrieken (v/h J. M. de Muinck Keizer), Utrecht, Holland. (*Steel ingots, blooms, billets and castings.*)

ROUEN.

Aciéries de Maromme (E. Breton), Maromme (Seine Inférieure), France. (*Steel castings.*)

ST. ETIENNE.

Compagnie des Forges de Chatillon, Commentry et Neuves-Maisons, France.

Compagnie des Forges et Aciéries de la Marine et d'Homécourt, St. Chamond (Loire), France.

Fonderies, Forges et Aciéries de St. Etienne, St. Etienne, France.

Forges de la Loire et du Midi (Messrs. Marrel Frères), Rive de Gier, France.

Holtzer, Jacob, & Cie., Aciéries d'Unieux, Unieux (Loire), France. (*Steel castings.*)

Schneider & Co., Creusot.

Société Anonyme de Commentry-Fourchambault et Decazeville, Imphy (Nievre). (*Steel ingots, bars, sections, castings and forgings.*)

Société Anonyme des Aciéries & Forges de Firminy, Firminy (Loire), France. (*Steel castings.*)

Société Anonyme des Hauts-Fourneaux, Fonderies & Forges de Franche-Comté, Besançon (Doubs), France.

Société Horme & Buire, Lyons. (*Steel castings.*)

SAN FRANCISCO, CAL.

Best Steel Casting Co., San Francisco, Cal., U.S.A. (*Steel castings.*)

Columbia Steel Company, Pittsburgh, Cal., U.S.A. (*Steel castings.*)

Columbia Steel Company, Torrance, Cal., U.S.A. (*Round bars, small sections, also steel castings.*)

Judson Manufacturing Co., Emeryville, Alameda Co., Cal., U.S.A. (*Steel ingots.*)

SAN FRANCISCO, CAL.—*continued.*

Pacific Coast Steel Co., South San Francisco, Cal., U.S.A. (*Steel ingots, small sections, and bars.*)

Southern California Iron & Steel Co. Los Angeles, Cal., U.S.A. (*Round bars.*)

Warman Steel Casting Co., Los Angeles, Cal., U.S.A. (*Steel castings.*)

West Coast Iron Co., 16th and Rhode Island Streets, San Francisco, Cal., U.S.A. (*Steel ingots for forgings.*)

SEATTLE, WASH.

Olympic Steel Works, Seattle, Wash., U.S.A. (*Steel castings.*)

Pacific Coast Steel Co., Seattle, Wash., U.S.A. (*Sections and bars.*)

Puget Sound Steel Works, Tacoma, Wash., U.S.A. (*Steel castings.*)

Washington Iron Works, Seattle, Wash., U.S.A. (*Steel castings.*)

STETTIN.

Berliner Actiengesellschaft für Eisengiesserei und Maschinenfabrikation, Berlin-Charlottenburg, Germany. (*Small steel castings.*)

Borsig, A., G.m.b.H., Berlin-Tegel, Germany. (*Steel ingots, forgings and castings.*)

Mitteldeutsche Stahlwerke Aktiengesellschaft, Stahl und Walzwerk Weber, Brandenburg (Havel), Germany. (*Steel plates and ingots.*)

Panzer Akt. Ges. Gussstahlwerk, Wolgast, Germany. (*Small steel castings.*)

Stahl und Walzwerk Hennigsdorf Aktiengesellschaft, Hennigsdorf, near Berlin. (*Steel castings and forgings.*)

STOCKHOLM.

Avesta Jernverks Aktiebolag, Avesta, Sweden. (*Steel plates, sections, and high pressure air receivers.*)

Bultfabriks Aktiebolaget, Hallstahammar, Sweden. (*Steel castings.*)

Fagersta Bruks Aktiebolag, Fagersta, Sweden. (*Steel blooms and billets.*)

Forsbacka Jernverks Aktiebolag, Forsbacka, Sweden. (*Steel blooms, billets, tubes, and forged and rolled bars.*)

Kohlswa Jernverks Aktiebolag. (*Melting Furnaces, Foundry and Forge* at Kohlswa, Sweden.)

Sandvikens Jernverks Aktiebolag, Sandviken, Sweden. (*Steel ingots, forgings, and steel tubes.*)

Smedjebackens Valsverks Aktiebolaget, Smedjebacken, Sweden. (*Steel sections and castings.*)

Stora Kopparbergs Bergslags Aktiebolag, Falun, Sweden. (*Steel Works* at Domnarfvet.) (*Sections of all sizes and plates up to $\frac{3}{4}$ in. thick.*)

Surahammars Bruks Aktiebolag, Surahammar, Sweden. (*Forge and Rolling Mills.*)

Uddeholms Aktiebolag, Uddeholm, Sweden. Nykroppa, Sweden. (*Steel ingots, forgings and bars.*) Storfors, Sweden. (*Weldless steel tubes.*)

SYDNEY, N.S.W.

Bradford & Kendall, Lim., Alexandria, Sydney, N.S.W. (*Steel castings.*)

Commonwealth Government Naval Dockyard, Cockatoo, Sydney, N.S.W. (*Steel castings.*)

Hadfields (Australia), Lim., Sydney, N.S.W. (*Steel castings and forgings.*)

Lithgow Iron & Steel Works, Lithgow, N.S.W. (*Bars and sections.*)

TORONTO, ONTARIO.

Algoma Steel Corporation, Lim., Sault St. Marie, Ontario, Canada. (*Steel billets, bars and angles.*)

Dominion Foundries & Steel, Lim., Hamilton, Ontario. (*Steel ingots, plates and castings.*)

Steel Company of Canada, Hamilton, Ontario. (*Works* at Hamilton and Belleville.) (*Bars and angles.*)

TRIESTE.

Alti Forni ed Acciaierie della Venezia Giulia, Servola, near Trieste.

Cantieri Navali ed Acciaierie di Venezia, Marghera, Italy. (*Steel castings.*)

Kranjska Industrjska Druzba, Jesenice-Fuzine, Yugoslavia.

VALENCIA.

Compania Siderurgica del Mediterraneo, Sagunto, Spain. (*Steel ingots, bars and sections.*)

VANCOUVER, B.C.

Vancouver Engineering Works, Lim., Vancouver, B.C. (*Steel castings.*)

VIENNA.

Baildonhütte, Spolka Akcyjna, Kattowice, Gorny Slask, Poland.

Berg-und Hüttenwerks Gesellschaft, Brno, Czecho-Slovakia. (*Works* at Trzynietz and Karlshütte.)

Bismarckhütte (Bismarckhütte and Falvahütte), Hajduki Wielkie, Gorny Slask, Poland. (*Also steel castings, and weldless rolled or drawn steel hollow pillars and davits.*)

Böhler, Gebr. & Co., Akt. Ges., Vienna. (*Works* at Kapfenberg, Styria, Austria.) (*Steel castings.*)

Borsigwerk Akt. Ges., Borsigwerk, Upper Silesia, Germany. (*Also steel castings.*)

Friedenshütte, Spolka Akcyjna, Nowy Bytom, Gorny Slask, Poland.

Ganz & Co., Danubius Akt. Ges., Ratibor, Upper Silesia, Germany. (*Steel castings.*)

Hahn (Albert), Röhrenwalzwerk, Bohumin, Czecho-Slovakia. (*Steel ingots, bars and sections.*)

Linke-Hofmann-Lauchhammer-Akt. Ges., Abt. Oberschlesische Werke, Gleiwitz, Upper Silesia, Germany.

Herminenhütte, Laband, Upper Silesia, Germany. (*Small sections and bars.*)

Julienhütte, Bobrek, Upper Silesia, Germany. (*Ingots, blooms and billets.*)

VIENNA—*continued.*

Mannesmannröhrenwerke Akt. Ges., Svinov-Vitkovice, Czecho-Slovakia. (*Weldless steel tubes.*)

Oesterreichisch-Alpine Montangesellschaft, Vienna, I, Austria. (*Works* at Donawitz, near Leoben, and Kindberg, Styria, Austria.)

Preussische Bergwerks- & Hütten-Aktiengesellschaft, Hüttenamt Gleiwitz, Gleiwitz, Upper Silesia, Germany. (*Steel castings.*)

Rimamurany-Salgotarjaner Eisenwerks-Akt. Ges., Budapest. (*Steel Works* at Ozd, Hungary.)

Schmidt (Rudolf) & Co., Vienna. (*Steel ingots.*)

Schoeller-Bleckmann Stahlwerke Akt. Ges., Vienna. (*Works* at Mürzzuschlag, Styria (*Steel bars*) and Ternitz, Nieder-Oesterreich. (*Steel bars and castings.*)

Société Anonyme des Forges et Acieries de Huta-Bankowa, Dombrowa, Poland. (*Steel plates, sections and castings.*)

Société Anonyme des Usines de Fabrication de Tubes et de Forges de Sosnowice, Warsaw, Poland. (*Works* at Sosnowice and Zawiercie.) (*Plates, bars and sections; seamless and welded tubes.*)

Statni Zelezarny a Ocelarny, Podbrezova, Czecho-Slovakia.

Steirische Gusstahlwerke Akt. Ges., Judenburg, Styria, Austria. (*Steel castings.*)

Vereinigte Oberschlesische Hüttenwerke Aktiengesellschaft, Stahlwerke in Gleiwitz, Gleiwitz, Upper Silesia, Germany. (*Steel ingots, blooms, forgings and seamless tubes.*)

Vitkovice Zelezarny (Witkowitzer Bergbau & Eisenhütten-Gewerkschaft), Moravska Ostrava, 10, Czecho-Slovakia.

Zelazohurt (Vereinigte Königs- & Laurahütte), Katowice, Poland. Krolewska Huta (Königshütte). (*Steel plates, angles, bars and forgings.*) Huta Laura (Laurahütte). (*Steel plates, angles, bars and weldless tubes.*)

WINTERTHUR.

Société Anonyme des Aciéries ci-devant Georges Fischer, Schaffhouse, Switzerland. (*Steel castings.*)

Société des Usines de Louis de Roll, Gerlafingen, Switzerland. (*Steel ingots, round bars and forgings.*)

Sulzer Frères, Société Anonyme, Winterthur, Switzerland. (*Steel castings.*)

YOKOHAMA.

Asano Shipbuilding Co., Lim., Tsurumi, Japan. (*Rolling Mills for plates.*)

Nippon Chuko Kabushiki Kaisha, Oshima-Cho, Tokyo, Japan.

Nippon Kokan Kabushiki Kaisha, Kawasaki, Japan. (*Steel tubes, bars and sections.*)

Oshima Steel Works, Oshima, Tokio, Japan. (*Steel castings and forgings.*)

Tokyo Kozai Kabushiki Kaisha,
Tokyo Works (*Steel ingots, bars and sections*);
Hirota Works (*Steel ingots.*)

Uraga Dock Co., Lim., Uraga, Japan. (*Steel castings.*)

(*Revised, July*, 1930.)

TABLES

OF

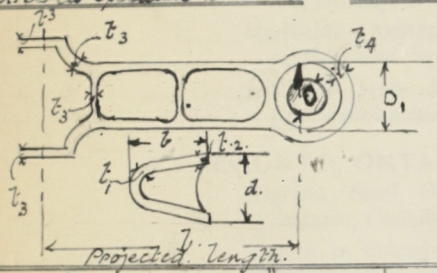
SCANTLINGS AND EQUIPMENT

FOR

STEEL VESSELS.

P

Twin. Screw Spectacle Brackets



TWIN. SCREW. SPECTACLE BRACKETS.

Numbers. $\frac{D^3L}{100}$ or $\frac{\cdot 3 D^3 L}{100}$.

D = Dia of Shaft in inches.

D_1 = Bore in inches.

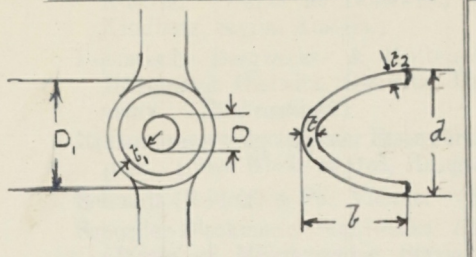
L = Length in feet.

t = thickness round boss not to be less than $\cdot 130$ or $\frac{2}{3} D_1$ with ordinary length of boss.

NUMBER. $\frac{D^3L}{100}$ OR. $\frac{\cdot 3 D^3 L}{100}$.		b. INCHES.	d. INCHES.	t_1 INCHES.	t_2 INCHES.	t_3. INCHES.
15 AND NOT EXCEEDING	30	9	6	1⅛.	⅞.	⅞.
30	50	10	7	1¼	1	⅞.
50	75	12	8	1½	1⅛.	1
75	110	14	9	1⅝.	1¼	1
110	150	15	10	1¾	1⅜.	1⅛.
150	200	16	11	2.	1½	1¼
200	260	18	12	2⅛	1⅝	1⅜.
260	340	20	13	2¼	1¾	1⅜
340	440	21	14	2½	1⅞	1½
440	560	22	15	2⅝.	2	1⅝
560	700	24	16	2¾	2⅛.	1⅝.
700	860	26	17	3	2¼	1¾
860	1040	27	18	3⅛.	2⅜	1¾
1040	1240	28	19	3¼	2½	1⅞
1240	1460	30	20	3½.	2⅝.	1⅞.
1460	1700	32	21	3¾	2¾	2.
1700	2000	33	22	3⅞.	2⅞	2⅛
2000	2350	34	23	4	3	2⅛
2350	2750	36	24	4⅛	3⅛	2¼
2750	3200	38	25	4¼	3¼	2¼

t_4 = thickness round boss not to be less than $\cdot 130$. or $\frac{2}{9}$ D1 with ordinary boss.

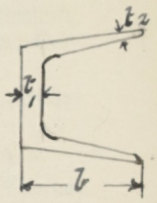
SINGLE. SCREW PROPELLER POST.



D: dia of Tail Shaft: = about $\frac{2}{3}$ D_1.	b. INCHES.	d.	t_2.
5	7.	5	⅞.
6	7	5	⅞
7	8	5	1
8.	8.	6	1⅛
9	9	6	1¼
10	10	7	1⅜.
11	11	7	1½
12	12	8	1½
13	13	8	1⅝
14	14	9	1¾
15	15	10	1⅞
16	16	10	1⅞
17	17	11	2
18	18	11	2
19	19	12	2⅛
20	20	13	2⅛
21	21	14	2¼
22	22	14	2¼
23	23	15	2⅜
24	24	16	2⅜

t_1 = thickness of boss not to be less than $\cdot 130$ with ordinary length of boss or $\frac{2}{9}$th D1.

STERN POSTS. IN VESSELS. HAVING NO APERTURES.



Dia. of Rudder Stock. IN INCHES.	b INCHES.	t_1 INCHES.	t_2 INCHES.
3	6½	⅞	⅞
3½	7	⅞	⅞
4	7½	1	1
4½	8	1⅛	1
5	8½	1¼	1⅛
5½	9	1⅜	1⅛
6	9½	1½	1¼
6½	10	1⅝	1¼
7	10½	1¾	1⅜
8	11½	2	1⅜
9	12½	2¼	1½
10	13	2½	1⅝
11	13½	2¾	1⅝
12	14½	3	1¾
13	15	3½	1¾
14	16	3½	1⅞
15	16½	3¾	2
16	17½	4	2
17	18	4¼	2⅛
18	19	4½	2⅛

Propeller Struts

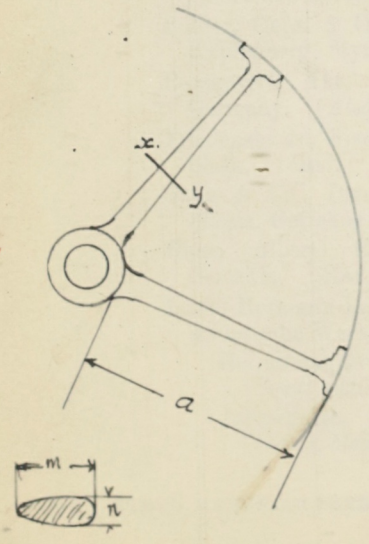
$$m \times n = \cdot 5\, D^2 \left\{1 + \cdot 04 \left(\frac{a}{n}\right)^2\right\}$$

$$\text{or} \quad = \cdot 22\, D_1^2 \left\{1 + 04 \left(\frac{a}{n}\right)^2\right\}$$

D = Dia of shaft in inches

D_1 Bore in inches.

a length of Strut in feet.



Section at x.y

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The scantlings of sectional materials used in the Tables are British Standard Sections. Where it is proposed to use sectional materials complying with the revised British Standards described on pages 411-413 of the Rules, the Committee will be prepared to accept scantlings for such sections on the basis of equivalent strength.

KEELS, STEMS and STERNFRAMES. TABLE 1

FIRST LONGITUDINAL NUMERAL L × D		BAR KEELS.	STEMS.	STERNFRAMES WITHOUT APERTURES.	STERNFRAMES WITH APERTURES.	
Full Scantling Vessels.	Complete Superstructure Vessels.				Stern Post.	Rudder Post.
		Inches.	Inches.	Inches.	Inches.	Inches.
1000		6 × 1	5½ × 1	5½ × 1	5¼ × 2¼	5 × 2¼
1500		6½ × 1¼	5¾ × 1⅛	5¾ × 1¼	5½ × 2¾	5¼ × 2¾
2000		7 × 1½	6 × 1¼	6 × 1½	5¾ × 3¼	5½ × 3¼
2500	3000	7 × 1¾	6¼ × 1⅜	6¼ × 1¾	6 × 3¾	5¾ × 3¾
3000	3500	7¼ × 1⅞	6½ × 1½	6½ × 2	6¼ × 4¼	5¾ × 4¼
3500	4000	7½ × 2	6¾ × 1⅝	6¾ × 2⅛	6½ × 4½	5¾ × 4½
4000	4500	7½ × 2¼	7 × 1¾	7 × 2¼	6¾ × 5	6 × 5
4500	5000	7¾ × 2⅜	7¼ × 1⅞	7¼ × 2⅜	7 × 5¼	6¼ × 5¼
5000	6000	8¼ × 2⅜	7½ × 2	7½ × 2½	7½ × 5½	6¾ × 5½
6000	7000	8½ × 2½	7¾ × 2⅛	8 × 2⅝	8½ × 5½	7½ × 5½
7000	8500	9 × 2⅝	8 × 2¼	9 × 2⅝	9 × 5¾	8 × 5¾
8500	10000	10 × 2⅝	8½ × 2¼	9½ × 2¾	9½ × 6¼	8½ × 6¼
10000	12000	10½ × 2¾	9 × 2⅜	10 × 2⅞	10 × 7	9 × 7
12000	14000	11 × 2⅞	9½ × 2½	10½ × 3	10½ × 7½	9 × 7½
14000	16500		10 × 2⅝	10½ × 3¼	10½ × 8½	9 × 8½
16500	19000		10½ × 2¾	11 × 3⅜	11 × 9	9½ × 9
19000	22000		11 × 2⅞	11½ × 3½	11½ × 9½	10 × 9½
22000	26000		11 × 3⅛	11½ × 3¾	12 × 10	10½ × 10
26000	30000		11½ × 3¼	12 × 3⅞	12½ × 10½	11 × 10½
	34000		12 × 3¼	12 × 4	12½ × 11	11 × 11
	38000		12 × 3½	12 × 4¼	13 × 11½	11½ × 11½

SIDE FRAMING.

FULL SCANTLING SINGLE DECK VESSELS—FLUSH DECK.

TABLE 2

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.				
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
10	21	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames	4 × 2½ × ·26	4 × 2½ × ·28	4 × 2½ × ·30	4 × 2½ × ·32	4 × 3 × ·32	
11	21½	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames	4 × 2½ × ·28	4 × 2½ × ·30	4 × 2½ × ·32	4 × 2½ × ·34	4 × 3 × ·34	4 × 3 × ·36
12	21½	Frames					2½ × 2½ × ·24	2½ × 2½ × ·26
		Reversed frames ..					2½ × 2½ × ·24	2½ × 2½ × ·26
		Depth of framing ..					2½	2½
		Angle frames	4 × 2½ × ·30		4 × 2½ × ·34	4½ × 3 × ·32	4½ × 3 × ·34	5 × 3 × ·30
13	22	Frames				3 × 2½ × ·24	3 × 2½ × ·26	3 × 2½ × ·28
		Reversed frames ..				2½ × 2½ × ·24	2½ × 2½ × ·26	2½ × 2½ × ·28
		Depth of framing ..				3	3	3
		Angle frames	4 × 2½ × ·34		4½ × 3 × ·32	5 × 3 × ·34	5 × 3 × ·38	5½ × 3 × ·34
14	22	Frames	2½ × 2½ × ·26			3 × 3 × ·28	3 × 3 × ·28	3 × 3 × ·30
		Reversed frames ..	2½ × 2½ × ·26			2½ × 2½ × ·28	3 × 2½ × ·28	3 × 2½ × ·30
		Depth of framing ..	2½			3	3½	3½
		Angle frames	4½ × 3 × ·38			5½ × 3 × ·34	5½ × 3 × ·40	6 × 3 × ·36
15	22½	Frames	3 × 2½ × ·26			3 × 3 × ·28	3 × 3 × ·30	3 × 3 × ·32
		Reversed frames ..	2½ × 2½ × ·26			3 × 2½ × ·28	3 × 2½ × ·30	3 × 2½ × ·32
		Depth of framing ..	3			3½	3½	3½
		Angle frames	5 × 3 × ·38			5½ × 3 × ·40	6 × 3 × ·36	6½ × 3 × ·34
16	22½	Frames	3½ × 2½ × ·26				3 × 3 × ·32	3 × 3 × ·34
		Reversed frames ..	2½ × 2½ × ·26				3 × 2½ × ·32	3 × 3 × ·34
		Depth of framing ..	3½				3½	3½
		Angle or bulb angle frames	5½ × 3 × ·36				6½ × 3 × ·34	5½ × 3 × ·32

SIDE FRAMING.

FULL SCANTLING SINGLE DECK VESSELS—FLUSH DECK.

TABLE 2

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.					
			Feet. 15	Feet. 16	Feet. 17	Feet. 18	Feet. 19	Feet. 20
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
10	21	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames						
11	$21\frac{1}{2}$	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames						
12	$21\frac{1}{2}$	Frames	$3 \times 2\frac{1}{2} \times .26$					
		Reversed frames ..	$2\frac{1}{2} \times 2\frac{1}{2} \times .26$					
		Depth of framing ..	3					
		Angle frames	$5 \times 3 \times .38$ 3·16					
13	22	Frames	$3 \times 2\frac{1}{2} \times .28$	$3 \times 2\frac{1}{2} \times .30$				
		Reversed frames ..	$3 \times 2\frac{1}{2} \times .38$	$3 \times 2\frac{1}{2} \times .30$				
		Depth of framing ..	$3\frac{1}{2}$	$3\frac{1}{2}$				
		Angle frames	$5\frac{1}{2} \times 3 \times .40$ 4·01	$6 \times 3 \times .36$ 4·31	4·61	4·91		
14	22	Frames	$3 \times 3 \times .32$	$3 \times 3 \times .30$	$3 \times 3 \times .32$			
		Reversed frames ..	$3 \times 2\frac{1}{2} \times .32$	$3 \times 3 \times .30$	$3 \times 3 \times .32$			
		Depth of framing ..	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$			
		Angle or bulb angle frames	$6\frac{1}{2} \times 3 \times .34$ 4·42	$6\frac{1}{2} \times 3 \times .38$ 5·25	$5\frac{1}{2} \times 3 \times .28$ 5·5	5½ × 3 × .34 5·95		
15	$22\frac{1}{2}$	Frames	$3 \times 3 \times .32$	$3\frac{1}{2} \times 3 \times .30$	$3\frac{1}{2} \times 3 \times .32$	$3\frac{1}{2} \times 3 \times .32$		
		Reversed frames ..	$3 \times 3 \times .32$	$3 \times 3 \times .30$	$3 \times 3 \times .32$	$3\frac{1}{2} \times 3 \times .32$		
		Depth of framing ..	$3\frac{1}{2}$	4	4	$4\frac{1}{2}$		
		Bulb angle frames..	$5\frac{1}{2} \times 3 \times .28$ 5·5	$5\frac{1}{2} \times 3 \times .34$ 5·95	$5\frac{1}{2} \times 3 \times .40$ 6·44	$6 \times 3 \times .38$ 7·5		
16	$22\frac{1}{2}$	Frames	$3\frac{1}{2} \times 3 \times .30$	$3\frac{1}{2} \times 3 \times .32$	$3\frac{1}{2} \times 3 \times .32$	$3\frac{1}{2} \times 3 \times .36$	$4 \times 3 \times .36$	
		Reversed frames ..	$3 \times 3 \times .30$	$3 \times 3 \times .32$	$3\frac{1}{2} \times 3 \times .32$	$3\frac{1}{2} \times 3 \times .36$	$3\frac{1}{2} \times 3 \times .36$	
		Depth of framing ..	4	4	$4\frac{1}{2}$	$4\frac{1}{2}$	5	
		Bulb angle frames..	$5\frac{1}{2} \times 3 \times .34$ 5·95	$5\frac{1}{2} \times 3 \times .40$ 6·40	$6 \times 3 \times .38$ 7·5	$6\frac{1}{2} \times 3 \times .32$ 8·15	$6\frac{1}{2} \times 3 \times .44$ 9·35	

SIDE FRAMING.

FULL SCANTLING SINGLE DECK VESSELS—FLUSH DECK.

TABLE 2

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.				
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
10	21	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames	4 ×2½×·26	4 ×2½×·28	4 ×2½×·30	4 ×2½×·32	4 ×3 ×·32	
11	21½	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames	4 ×2½×·28	4 ×2½×·30	4 ×2½×·32	4 ×2½×·34	4 ×3 ×·34	4 ×3 ×·36
12	21½	Frames					2½×2½×·24	2½×2½×·26
		Reversed frames ..					2½×2½×·24	2½×2½×·26
		Depth of framing ..					2½	2½
		Angle frames	4 ×2½×·30		4 ×2½×·34	4½×3 ×·32	4½×3 ×·34	5 ×3 ×·30
13	22	Frames				3 ×2½×·24	3 ×2½×·26	3 ×2½×·28
		Reversed frames ..				2½×2½×·24	2½×2½×·26	2½×2½×·28
		Depth of framing ..				3	3	3
		Angle frames	4 ×2½×·34		4½×3 ×·32	5 ×3 ×·34	5 ×3 ×·38	5½×3 ×·34
14	22	Frames	2½×2½×·26			3 ×3 ×·28	3 ×3 ×·28	3 ×3 ×·30
		Reversed frames ..	2½×2½×·26			2½×2½×·28	3 ×2½×·28	3 ×2½×·30
		Depth of framing ..	2½			3	3½	3½
		Angle frames	4½×3 ×·38			5½×3 ×·34	5½×3 ×·40	6 ×3 ×·36
15	22½	Frames	3 ×2½×·26			3 ×3 ×·28	3 ×3 ×·30	3 ×3 ×·32
		Reversed frames ..	2½×2½×·26			3 ×2½×·28	3 ×2½×·30	3 ×2½×·32
		Depth of framing ..	3			3½	3½	3½
		Angle frames	5 ×3 ×·38			5½×3 ×·40	6 ×3 ×·36	6½×3 ×·34
16	22½	Frames	3½×2½×·26				3 ×3 ×·32	3 ×3 ×·34
		Reversed frames ..	2½×2½×·26				3 ×2½×·32	3 ×3 ×·34
		Depth of framing ..	3½				3½	3½
		Angle or bulb angle frames	5½×3 ×·36				6½×3 ×·34	5½×3 ×·32

SIDE FRAMING.

FULL SCANTLING SINGLE DECK VESSELS—FLUSH DECK.

TABLE 2

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.					
			Feet. 15	Feet. 16	Feet. 17	Feet. 18	Feet. 19	Feet. 20
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
10	21	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames						
11	21½	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames						
12	21½	Frames	3 ×2½×·26					
		Reversed frames ..	2½×2½×·26					
		Depth of framing ..	3					
		Angle frames	5 ×3 ×·38 3·16					
13	22	Frames	3 ×2½×·28	3 ×2½×·30				
		Reversed frames ..	3 ×2½×·38	3 ×2½×·30				
		Depth of framing ..	3½	3½				
		Angle frames	5½×3 ×·40 4·01	6 ×3 ×·36 4·31	4·61	4·91		
14	22	Frames	3 ×3 ×·32	3 ×3 ×·30	3 ×3 ×·32			
		Reversed frames ..	3 ×2½×·32	3 ×3 ×·30	3 ×3 ×·32			
		Depth of framing ..	3½	3½	3½			
		Angle or bulb angle frames	6½×3 ×·34 4·42	6½×3 ×·38 5·25	5½×3 ×·28 4·5	5½×3 ×·32 5·95		
15	22½	Frames	3 ×3 ×·32	3½×3 ×·30	3½×3 ×·32	3½×3 ×·32		
		Reversed frames ..	3 ×3 ×·32	3 ×3 ×·30	3 ×3 ×·32	3½×3 ×·32		
		Depth of framing ..	3½	4	4	4½		
		Bulb angle frames..	5½×3 ×·28 5·5	5½×3 ×·34 5·95	5½×3 ×·40 6·34	6 ×3 ×·38 7·5		
16	22½	Frames	3½×3 ×·30	3½×3 ×·32	3½×3 ×·32	3½×3 ×·36	4 ×3 ×·36	
		Reversed frames ..	3 ×3 ×·30	3 ×3 ×·32	3½×3 ×·32	3½×3 ×·36	3½×3 ×·36	
		Depth of framing ..	4	4	4½	4½	5	
		Bulb angle frames..	5½×3 ×·34 5·95	5½×3 ×·40 6·40	6 ×3 ×·38 7·5	6½×3 ×·32 8·15	6½×3 ×·44 9·35	

SIDE FRAMING.

FULL SCANTLING SINGLE DECK VESSELS—FLUSH DECK.

TABLE 2

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.					
				Feet. 14	Feet. 15	Feet. 16	Feet. 17	Feet. 18	Feet. 19
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
17	23	Frames	$3\frac{1}{2}\times2\frac{1}{2}\times\cdot28$	$3\frac{1}{2}\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot34$
		Reversed frames ..	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot28$	$3\times3\times\cdot30$	$3\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot36$	$3\frac{1}{2}\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot34$
		Depth of framing..	$3\frac{1}{2}$	4	4	$4\frac{1}{2}$	$4\frac{1}{2}$	5	$5\frac{1}{2}$
		Angle or bulb angle frames	$5\frac{1}{2}\times3\times\cdot40$ 20·8 4·01	$5\frac{1}{2}\times3\times\cdot34$ 5·95	$5\frac{1}{2}\times3\times\cdot40$ 6·40	$6\times3\times\cdot38$ 7·50	$6\frac{1}{2}\times3\times\cdot32$ 8·15	$6\frac{1}{2}\times3\times\cdot38$ 8·45	$7\times3\times\cdot36$ 10·10
18	23	Frames	$3\frac{1}{2}\times2\frac{1}{2}\times\cdot28$		$4\times3\times\cdot32$	$4\times3\times\cdot34$	$4\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot32$	$4\frac{1}{2}\times3\times\cdot36$
		Reversed frames ..	$3\times2\frac{1}{2}\times\cdot26$		$3\times3\times\cdot23$	$3\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot36$
		Depth of framing..	4		$4\frac{1}{2}$	$4\frac{1}{2}$	5	$5\frac{1}{2}$	$5\frac{1}{2}$
		Angle or bulb angle frames	$6\times3\times\cdot38$ 4·53	6·40	$6\times3\times\cdot38$ 7·5	$6\times3\times\cdot42$ 7·8	$6\frac{1}{2}\times3\times\cdot38$ 8·45	$6\frac{1}{2}\times3\times\cdot46$ 9·55	$7\times3\times\cdot40$ 10·10
19	$23\frac{1}{2}$	Frames	$3\frac{1}{2}\times3\times\cdot28$			$4\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot32$	$4\frac{1}{2}\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot40$
		Reversed frames ..	$3\times2\frac{1}{2}\times\cdot28$			$3\frac{1}{2}\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot40$
		Depth of framing..	4			5	$5\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{1}{2}$
		Angle or bulb angle frames	$6\frac{1}{2}\times3\times\cdot34$ 4·42	7·50	7·80	$6\frac{1}{2}\times3\times\cdot38$ 8·45	$6\frac{1}{2}\times3\times\cdot46$ 9·55	$7\times3\times\cdot40$ 10·60	$7\frac{1}{2}\times3\times\cdot36$ 11·60
20	$23\frac{1}{2}$	Frames	$3\frac{1}{2}\times3\times\cdot30$				$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot40$	$4\frac{1}{2}\times3\times\cdot40$
		Reversed frames ..	$3\times2\frac{1}{2}\times\cdot30$				$4\times3\times\cdot38$	$4\times3\times\cdot40$	$4\frac{1}{2}\times3\times\cdot40$
		Depth of framing..	4				$5\frac{1}{2}$	$5\frac{1}{2}$	6
		Angle or bulb angle frames	$6\frac{1}{2}\times3\times\cdot36$ 5·0			7×3×·36 10·2	$7\times3\times\cdot44$ 11·0	$7\frac{1}{2}\times3\times\cdot36$ 11·8	$7\frac{1}{2}\times3\times\cdot44$ 12·8
21	24	Frames	$3\frac{1}{2}\times3\times\cdot30$					$4\frac{1}{2}\times3\times\cdot42$	$5\times3\times\cdot40$
		Reversed frames ..	$3\times3\times\cdot30$					$4\frac{1}{2}\times3\times\cdot42$	$4\frac{1}{2}\times3\times\cdot40$
		Depth of framing..	4					6	$6\frac{1}{2}$
		Bulb angle frames	$5\frac{1}{2}\times3\times\cdot34$ 5·95				8×3×·36 13·55	$8\times3\times\cdot38$ 13·85	$8\times3\times\cdot40$ 14·15
22	24	Frames	$3\frac{1}{2}\times3\times\cdot32$						$5\times3\times\cdot40$
		Reversed frames ..	$3\times3\times\cdot32$						$5\times3\times\cdot40$
		Depth of framing..	4						7
		Bulb angle frames..	$5\frac{1}{2}\times3\times\cdot40$ 6·40	10·2				8×3×·44 14·45	$8\frac{1}{2}\times3\times\cdot40$ 14·15
23	$24\frac{1}{2}$	Frames	$3\frac{1}{2}\times3\times\cdot34$						$5\times3\times\cdot44$
		Reversed frames ..	$3\times3\times\cdot34$						$5\times3\times\cdot44$
		Depth of framing..	4						7
		Bulb angle frames..	$6\times3\times\cdot30$ 6·80					8½×3×·40 14·15	$8\frac{1}{2}\times3\times\cdot46$ 14·05

In permanent coal bunkers frames measured + 06

SIDE FRAMING.

FULL SCANTLING SINGLE DECK VESSELS—FLUSH DECK.

TABLE 2

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.						
			Feet. 20	Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25	Feet. 26
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
17	23	Frames	$4\frac{1}{2}\times3\times\cdot38$						
		Reversed frames ..	$4\times3\times\cdot38$						
		Depth of framing..	$5\frac{1}{2}$						
		Bulb angle frames..	$7\times3\times\cdot44$ 11.0						
18	23	Frames	$4\frac{1}{2}\times3\times\cdot38$	$5\times3\times\cdot38$					
		Reversed frames ..	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$					
		Depth of framing..	6	$6\frac{1}{2}$					
		Bulb angle frames..	$7\frac{1}{2}\times3\times\cdot40$ 12.3	$8\times3\times\cdot38$ 13.85					
19	$23\frac{1}{2}$	Frames	$4\frac{1}{2}\times3\times\cdot40$	$5\times3\times\cdot40$	$5\times3\times\cdot40$				
		Reversed frames ..	$4\frac{1}{2}\times3\times\cdot40$	$4\frac{1}{2}\times3\times\cdot40$	$5\times3\times\cdot40$				
		Depth of framing..	6	$6\frac{1}{2}$	7				
		Bulb angle frames..	$7\frac{1}{2}\times3\times\cdot42$ 12.55	$8\times3\times\cdot40$ 14.15	$8\times3\times\cdot52$ 15.34	?			
20	$23\frac{1}{2}$	Frames	$5\times3\times\cdot38$	$5\times3\times\cdot42$	$5\times3\times\cdot42$	$5\frac{1}{2}\times3\times\cdot42$			
		Reversed frames ..	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot42$	$5\times3\times\cdot42$	$5\times3\times\cdot42$			
		Depth of framing..	$6\frac{1}{2}$	$6\frac{1}{2}$	7	$7\frac{1}{2}$			
		Bulb angle frames..	$8\times3\times\cdot38$ 13.85	$8\times3\times\cdot44$ 14.40	$8\frac{1}{2}\times3\times\cdot42$ 16.45	$8\frac{1}{2}\times3\times\cdot52$ 18.6			
21	24	Frames	$5\times3\times\cdot42$	$5\times3\times\cdot42$	$5\frac{1}{2}\times3\times\cdot40$	$5\frac{1}{2}\times3\times\cdot42$	$6\times3\times\cdot44$		
		Reversed frames ..	$4\frac{1}{2}\times3\times\cdot42$	$5\times3\times\cdot42$	$5\times3\times\cdot40$	$5\frac{1}{2}\times3\times\cdot42$	$5\frac{1}{2}\times3\times\cdot44$		
		Depth of framing..	$6\frac{1}{2}$	7	$7\frac{1}{2}$	8	$8\frac{1}{2}$		
		Bulb angle frames..	$8\times3\times\cdot44$ 14.40	$8\frac{1}{2}\times3\times\cdot42$ 16.45	$8\frac{1}{2}\times3\times\cdot48$ 17.35	$9\times3\times\cdot48$ 19.85	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 22.3		
22	24	Frames	$5\times3\times\cdot44$	$5\frac{1}{2}\times3\times\cdot42$	$5\frac{1}{2}\times3\times\cdot40$	$5\frac{1}{2}\times3\times\cdot44$	$6\times3\times\cdot46$	$6\times3\times\cdot46$	
		Reversed frames ..	$5\times3\times\cdot44$	$5\times3\times\cdot42$	$5\frac{1}{2}\times3\times\cdot40$	$5\frac{1}{2}\times3\times\cdot44$	$5\frac{1}{2}\times3\times\cdot46$	$6\times3\times\cdot46$	
		Depth of framing..	7	$7\frac{1}{2}$	8	8	$8\frac{1}{2}$	9	
		Bulb angle frames..	$8\frac{1}{2}\times3\times\cdot46$ 17.05	$8\frac{1}{2}\times3\times\cdot52$ 18.0	$9\times3\times\cdot42$ 18.95	$9\times3\times\cdot50$ 20.20	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 22.95	$10\times3\frac{1}{2}\times\cdot48$ 24.85	
23	$24\frac{1}{2}$	Frames	$5\frac{1}{2}\times3\times\cdot44$	$5\frac{1}{2}\times3\times\cdot44$	$6\times3\times\cdot44$				
		Reversed frames ..	$5\times3\times\cdot44$	$5\frac{1}{2}\times3\times\cdot44$	$5\frac{1}{2}\times3\times\cdot44$				
		Depth of framing..	$7\frac{1}{2}$	8	$8\frac{1}{2}$				
		Bulb angle frames..	$9\times3\times\cdot42$ 18.85	$9\times3\times\cdot50$ 20.20	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 22.30				

SIDE FRAMING.

FULL SCANTLING SINGLE DECK VESSELS—FLUSH DECK.

TABLE 2

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.				
				Feet. 20	Feet. 21	Feet. 22	Feet. 23	Feet. 24
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
24	25	Frames..	4 ×3×·32	6 ×3×·42	6 ×3 ×·42	6 ×3 ×·44	6 ×3 ×·42	
		Reversed frames ..	3 ×3×·32	5 ×3×·42	5½×3 ×·42	5½×3½×·44	6 ×3½×·42	
		Depth of framing ..	4½	8	8½	8½	9	
		Bulb angle frames..	6 ×3×·38 7·5	9 ×3×·46 19·55	9½×3½×·44 21·35	10 ×3½×·46 24·35	10 ×3½×·50 25·35	
25	25½	Frames..	4 ×3×·34		6 ×3 ×·46	6 ×3 ×·46	6 ×3 ×·46	6½×3 ×·46
		Reversed frames ..	3 ×3×·34		5½×3 ×·46	5½×3½×·46	6 ×3½×·46	6 ×3½×·46
		Depth of framing ..	4½		8½	8½	9	9½
		Bulb angle frames..	6 ×3×·42 7·8		9½×3½×·50 22·45	10 ×3½×·50 25·35	10½×3½×·46 24·50	10½×3½×·54 29·50
26	26	Frames..	4 ×3×·36			6 ×3½×·46	6½×3½×·46	6½×3½×·46
		Reversed frames ..	3 ×3×·36			6 ×3½×·46	6 ×3½×·46	6½×3½×·46
		Depth of framing ..	4½			9	9½	10
		Bulb angle frames..	6½×3×·32			10½×3½×·46 24·50	10½×3½×·54 29·50	11 ×3½×·50 31·40
27	26½	Frames..	4½×3×·36				6½×3½×·46	6½×3½×·48
		Reversed frames ..	3 ×3×·38				6½×3½×·46	6½×3½×·48
		Depth of framing ..	4½				10	10
		Bulb angle frames..	6½×3×·36				11 ×3½×·50 31·40	11 ×3½×·56 32·90
28	27	Frames..	4½×3×·36					7 ×3½×·48
		Reversed frames ..	3 ×3×·36					6½×3½×·48
		Depth of framing ..	5					10½
		Bulb angle frames..	6½×3×·44				32·9	11½×3½×·50 34·40
29	27½	Frames..	5 ×3×·36					
		Reversed frames ..	3 ×3×·36					
		Depth of framing ..	5½					
		Bulb angle frames..	7 ×3×·40					11½·3½·56 36·3.
30	28	Frames..	5½×3×·38					
		Reversed frames ..	3 ×3×·38					
		Depth of framing ..	5½					
		Bulb angle frames ..	7 ×3×·44					

SIDE FRAMING.

FULL SCANTLING SINGLE DECK VESSELS—FLUSH DECK.

TABLE 2 *(Concluded.)*

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.					
			Feet. 25	Feet. 26	Feet. 27	Feet. 28	Feet. 29	Feet. 30
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
24	25	Frames..						
		Reversed frames ..						
		Depth of framing ..						
		Bulb angle frames..						
25	$25\frac{1}{2}$	Frames..						
		Reversed frames ..						
		Depth of framing ..						
		Bulb angle frames..						
26	26	Frames..	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$					
		Reversed frames ..	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$					
		Depth of framing ..	10					
		Bulb angle frames..	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 34.10					
27	$26\frac{1}{2}$	Frames..	$7 \times 3\frac{1}{2} \times \cdot 48$	$7 \times 3\frac{1}{2} \times \cdot 52$				
		Reversed frames ..	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	$7 \times 3\frac{1}{2} \times \cdot 52$				
		Depth of framing ..	$10\frac{1}{2}$	$10\frac{1}{2}$				
		Bulb angle frames..	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 34.40	$12 \times 3\frac{1}{2} \times \cdot 48$ 37.10				
28	27	Frames..	$7 \times 3\frac{1}{2} \times \cdot 52$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$			
		Reversed frames ..	$7 \times 3\frac{1}{2} \times \cdot 52$	$7 \times 3\frac{1}{2} \times \cdot 52$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$			
		Depth of framing ..	$10\frac{1}{2}$	11	$11\frac{1}{2}$			
		Bulb angle frames..	$12 \times 3\frac{1}{2} \times \cdot 48$ 34.10	$12 \times 3\frac{1}{2} \times \cdot 58$ 40.10	$12 \times 3\frac{1}{2} \times \cdot 66$ 42.10			
29	$27\frac{1}{2}$	Frames..	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$8 \times 3\frac{1}{2} \times \cdot 52$	$8 \times 3\frac{1}{2} \times \cdot 52$		
		Reversed frames ..	$7 \times 3\frac{1}{2} \times \cdot 52$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$8 \times 3\frac{1}{2} \times \cdot 52$		
		Depth of framing ..	11	$11\frac{1}{2}$	12	$12\frac{1}{2}$		
		Bulb angle or channel frames	$12 \times 3\frac{1}{2} \times \cdot 56$ 39.50	$12 \times 3\frac{1}{2} \times \cdot 66$ 42.10	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ 45.40	$12 \times 4 \times 4 \times \cdot 52$ 47.60		
30	28	Frames..		$8 \times 3\frac{1}{2} \times \cdot 52$	$8 \times 3\frac{1}{2} \times \cdot 52$	$8 \times 3\frac{1}{2} \times \cdot 54$	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	
		Reversed frames ..		$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$8 \times 3\frac{1}{2} \times \cdot 52$	$8 \times 3\frac{1}{2} \times \cdot 54$	$8 \times 3\frac{1}{2} \times \cdot 54$	
		Depth of framing ..		12	$12\frac{1}{2}$	$12\frac{1}{2}$	13	
		Channel frames ..	41.9.	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ 45.40	$12 \times 4 \times 4 \times \cdot 52$ 47.60	$12 \times 4 \times 4 \times \cdot 56$ 49.30	$13 \times 4 \times 4 \times \cdot 50$ 52.60	

47.6

SIDE FRAMING. Standard height

FULL SCANTLING SINGLE DECK VESSELS WITH 100 PER CENT. SUPERSTRUCTURES.

TABLE 2A (SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.				
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
10	21	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames	4 × 2½ × ·28 1.55	4 × 2½ × ·28 1.55	4 × 2½ × ·32 1.77	4 × 3 × ·36 2.00	4½ × 3 × ·34 2.34	
11	21½	Frames				2½ × 2½ × ·26	2½ × 2½ × ·28	3 × 2½ × ·26
		Reversed frames ..		1.62 .28	1.94 1.62 .32	2½ × 2½ × ·26	2½ × 2½ × ·28	2½ × 2½ × ·26
		Depth of framing ..				2½	2½	3
		Angle frames	4 × 2½ × ·30 1.66	4 × 2½ × ·30 1.66	4 × 3 × ·36 2.0	4½ × 3 × ·36 2.47	4½ × 3 × ·40 2.93	5 × 3 × ·38 3.16
12	21½	Frames				3 × 2½ × ·24	3 × 2½ × ·28	3 × 2½ × ·28
		Reversed frames ..				2½ × 2½ × ·24	2½ × 2½ × ·28	3 × 2½ × ·28
		Depth of framing ..				3	3	3½
		Angle frames	4 × 2½ × ·34 1.88	2.0	4½ × 3 × ·34 2.34	5 × 3 × ·36 3.01	5 × 3 × ·40 3.32	5½ × 3 × ·40 4.01
13	22	Frames			2½ × 2½ × ·28	3 × 2½ × ·28	3 × 2½ × ·28	3 × 3 × ·26
		Reversed frames ..			2½ × 2½ × ·28	2½ × 2½ × ·28	3 × 2½ × ·28	3 × 3 × ·26
		Depth of framing ..			2½	3	3½	3½
		Angle frames	4½ × 3 × ·34 2.34		4½ × 3 × ·40 2.93	5 × 3 × ·40 3.32	5½ × 3 × ·40 4.01	6 × 3 × ·38 4.53
14	22	Frames	3 × 2½ × ·26			3 × 2½ × ·28	3 × 3 × ·26	3 × 3 × ·30
		Reversed frames ..	2½ × 2½ × ·26			3 × 2½ × ·28	3 × 3 × ·26	3 × 3 × ·30
		Depth of framing ..	3			3½	3½	3½
		Angle frames	5 × 3 × ·38 3.16		3.32	5½ × 3 × ·40 4.01	6 × 3 × ·38 4.53	6½ × 3 × ·38 5.25
15	22½	Frames	3½ × 2½ × ·26			3 × 3 × ·26	3 × 3 × ·30	3 × 3 × ·34
		Reversed frames ..	2½ × 2½ × ·26			3 × 3 × ·26	3 × 3 × ·30	3 × 3 × ·34
		Depth of framing ..	3½			3½	3½	3½
		Angle or bulb angle frames	5½ × 3 × ·36 3.63		4.01	6 × 3 × ·38 4.53	6½ × 3 × ·38 5.25	5½ × 3 × ·32 5.80
16	22½	Frames	3½ × 2½ × ·26				3 × 3 × ·34	3½ × 3 × ·32
		Reversed frames ..	3 × 2½ × ·26				3 × 3 × ·34	3 × 3 × ·32
		Depth of framing ..	4				3½	4
		Angle or bulb angle frames	6 × 3 × ·36 4.31		4.53	5.25	5½ × 3 × ·32 5.80	5½ × 3 × ·40 6.40

SIDE FRAMING. Standard Height TABLE 2A

FULL SCANTLING SINGLE DECK VESSELS WITH 100 PER CENT. SUPERSTRUCTURES. (SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.					
			Feet. 15	Feet. 16	Feet. 17	Feet. 18	Feet. 19	Feet. 20
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
10	21	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames						
11	$21\frac{1}{2}$	Frames						
		Reversed frames ..						
		Depth of framing ..						
		Angle frames						
12	$21\frac{1}{2}$	Frames	3 ×$2\frac{1}{2}$×·30					
		Reversed frames ..	3 ×$2\frac{1}{2}$×·30					
		Depth of framing ..	$3\frac{1}{2}$					
		Angle frames	$5\frac{1}{2}$×3 ×·42 4·20					
13	22	Frames	3 ×3 ×·30	3 ×3 ×·32				
		Reversed frames ..	3 ×3 ×·30	3 ×3 ×·32				
		Depth of framing ..	$3\frac{1}{2}$	$3\frac{1}{2}$				
		Angle or bulb angle frames	$6\frac{1}{2}$×3 ×·38 5·25	$5\frac{1}{2}$×3 ×·28 5·50				
14	22	Frames	3 ×3 ×·34	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·36			
		Reversed frames ..	3 ×3 ×·34	3 ×3 ×·32	3 ×3 ×·36			
		Depth of framing ..	$3\frac{1}{2}$	4	4			
		Bulb angle frames..	$5\frac{1}{2}$×3 ×·32 5·80	$5\frac{1}{2}$×3 ×·40 6·40	6 ×3 ×·34 7·15			
15	$22\frac{1}{2}$	Frames	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·36	4 ×3 ×·34		
		Reversed frames ..	3 ×3 ×·32	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·36	$3\frac{1}{2}$×3 ×·34		
		Depth of framing ..	4	$4\frac{1}{2}$	$4\frac{1}{2}$	5		
		Bulb angle frames..	$5\frac{1}{2}$×3 ×·40 6·40	6 ×3 ×·38 7·50	$6\frac{1}{2}$×3 ×·32 8·15	$6\frac{1}{2}$×3 ×·38 8·45		
16	$22\frac{1}{2}$	Frames	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·36	4 ×3 ×·34	4 ×3 ×·34	$4\frac{1}{2}$×3 ×·40	
		Reversed frames ..	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·36	$3\frac{1}{2}$×3 ×·34	4 ×3 ×·34	4 ×3 ×·40	
		Depth of framing ..	$4\frac{1}{2}$	$4\frac{1}{2}$	5	$5\frac{1}{2}$	$5\frac{1}{2}$	
		Bulb angle frames..	6 ×3 ×·38 7·50	$6\frac{1}{2}$×3 ×·32 8·15	$6\frac{1}{2}$×3 ×·38 8·45	7 ×3 ×·36 10·10	$7\frac{1}{2}$×3 ×·36 11·80	

SIDE FRAMING. Standard Height TABLE 2A

FULL SCANTLING SINGLE DECK VESSELS WITH 100 PER CENT. SUPERSTRUCTURES. (SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.					
				Feet. 14	Feet. 15	Feet. 16	Feet. 17	Feet. 18	Feet. 19
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
17	23	Frames	$3\frac{1}{2}\times2\frac{1}{2}\times\cdot28$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot34$	$4\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot38$	$5\times3\times\cdot38$
		Reversed frames ..	$3\times2\frac{1}{2}\times\cdot28$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot36$	$3\frac{1}{2}\times3\times\cdot34$	$4\times3\times\cdot34$	$4\times3\times\cdot38$	$4\times3\times\cdot38$
		Depth of framing..	4	$4\frac{1}{2}$	$4\frac{1}{2}$	5	$5\frac{1}{2}$	$5\frac{1}{2}$	6
		Angle or bulb angle frames	$6\frac{1}{2}\times3\times\cdot36$ 5·35	$6\times3\times\cdot38$ 7·50	$6\frac{1}{2}\times3\times\cdot32$ 8·15	$6\frac{1}{2}\times3\times\cdot38$ 8·75	$7\times3\times\cdot36$ 10·10	$7\times3\times\cdot44$ 11·0	$7\frac{1}{2}\times3\times\cdot40$ 12·30
18	23	Frames	$3\frac{1}{2}\times3\times\cdot30$		$4\times3\times\cdot32$	$4\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot38$	$5\times3\times\cdot38$	$5\times3\times\cdot42$
		Reversed frames ..	$3\times3\times\cdot30$		$4\times3\times\cdot32$	$4\times3\times\cdot34$	$4\times3\times\cdot38$	$4\times3\times\cdot38$	$4\times3\times\cdot42$
		Depth of framing..	4		$5\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{1}{2}$	6	6
		Bulb angle frames..	$5\frac{1}{2}\times3\times\cdot34$ 5·95	$6\frac{1}{2}\times3\times\cdot38$ 8·45	$6\frac{1}{2}\times3\times\cdot46$ 9·55	$7\times3\times\cdot36$ 10·10	$7\times3\times\cdot44$ 11·0	$7\frac{1}{2}\times3\times\cdot40$ 12·30	$8\times3\times\cdot38$ 13·85
19	$23\frac{1}{2}$	Frames	$3\frac{1}{2}\times3\times\cdot32$			$4\frac{1}{2}\times3\times\cdot36$	$5\times3\times\cdot38$	$5\times3\times\cdot42$	$5\times3\times\cdot42$
		Reversed frames ..	$3\times3\times\cdot32$			$4\times3\times\cdot36$	$4\times3\times\cdot38$	$4\times3\times\cdot42$	$4\frac{1}{2}\times3\times\cdot42$
		Depth of framing..	4			6	6	6	$6\frac{1}{2}$
		Bulb angle frames..	$5\frac{1}{2}\times3\times\cdot40$ 6·20	7×3×·32 9·65	7×3×·40 10·60	$7\frac{1}{2}\times3\times\cdot36$ 11·80	$7\frac{1}{2}\times3\times\cdot40$ 12·30	$8\times3\times\cdot38$ 13·85	$8\times3\times\cdot44$ 14·40
20	$23\frac{1}{2}$	Frames	$3\frac{1}{2}\times3\times\cdot34$				$5\times3\times\cdot38$	$5\times3\times\cdot42$	$5\times3\times\cdot42$
		Reversed frames ..	$3\times3\times\cdot34$				$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$5\times3\times\cdot42$
		Depth of framing..	4				$6\frac{1}{2}$	$6\frac{1}{2}$	7
		Bulb angle frames..	$6\times3\times\cdot30$ 6·60				$8\times3\times\cdot38$ 13·85	$8\times3\times\cdot44$ 14·40	$8\frac{1}{2}\times3\times\cdot42$ 16·45
21	24	Frames	$4\times3\times\cdot32$					$5\times3\times\cdot44$	$5\frac{1}{2}\times3\times\cdot42$
		Reversed frames ..	$3\times3\times\cdot32$					$5\times3\times\cdot44$	$5\times3\times\cdot42$
		Depth of framing..	$4\frac{1}{2}$					7	$7\frac{1}{2}$
		Bulb angle frames..	$6\times3\times\cdot38$ 7·50					$8\frac{1}{2}\times3\times\cdot46$ 17·05	$8\frac{1}{2}\times3\times\cdot52$ 18·0
22	24	Frames	$4\times3\times\cdot34$						$5\frac{1}{2}\times3\times\cdot44$
		Reversed frames ..	$3\times3\times\cdot34$						$5\frac{1}{2}\times3\times\cdot44$
		Depth of framing..	$4\frac{1}{2}$						8
		Bulb angle frames..	$6\times3\times\cdot42$ 7·9					9×3×4·2 18·85	$9\times3\times\cdot50$ 20·20
23	$24\frac{1}{2}$	Frames	$4\frac{1}{2}\times3\times\cdot34$						$6\times3\times\cdot42$
		Reversed frames ..	$3\times3\times\cdot34$						$5\frac{1}{2}\times3\times\cdot42$
		Depth of framing..	5						$8\frac{1}{2}$
		Bulb angle frames..	$6\frac{1}{2}\times3\times\cdot38$ 8·6					9×3·50 20·20	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot44$ 21·25

SIDE FRAMING. Standard Height TABLE 2A

FULL SCANTLING SINGLE DECK VESSELS WITH 100 PER CENT. SUPERSTRUCTURES. (SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.						
			Feet. 20	Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25	Feet. 26
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
17	23	Frames	5 ×3 ×·38						
		Reversed frames ..	4½ ×3 ×·38						
		Depth of framing ..	6½						
		Bulb angle frames..	8 ×3 ×·38 13·85						
18	23	Frames	5 ×3 ×·42	5 ×3 ×·42					
		Reversed frames ..	4½ ×3 ×·42	5 ×3 ×·42					
		Depth of framing ..	6½	7					
		Bulb angle frames..	8 ×3 ×·44 14·30	8½ ×3 ×·42 16·45					
19	23½	Frames	5½ ×3 ×·40	5½ ×3 ×·40	5½ ×3 ×·44				
		Reversed frames ..	4½ ×3 ×·40	5 ×3 ×·40	5 ×3 ×·44				
		Depth of framing ..	7	7½	7½				
		Bulb angle frames..	8 ×3 ×·52 15·75	8½ ×3 ×·48 17 35	9 ×3 ×·42 18·5				
20	23½	Frames	5½ ×3 ×·40	5½ ×3 ×·44	5½ ×3 ×·44	6 ×3 ×·40			
		Reversed frames ..	5 ×3 ×·40	5 ×3 ×·44	5½ ×3 ×·44	5½ ×3½ ×·40			
		Depth of framing ..	7½	7½	8	8½			
		Bulb angle frames..	8½ ×3 ×·48 17·35	9 ×3 ×·42 18·85	9 ×3 ×·50 20 2	9½ ×3½ ×·48 22·3			
21	24	Frames	5½ ×3 ×·40	5½ ×3 ×·44	6 ×3 ×·40	6 ×3 ×·40	6½ ×3 ×·42		
		Reversed frames ..	5½ ×3 ×·40	5½ ×3 ×·44	5½ ×3½ ×·40	6 ×3½ ×·40	6 ×3½ ×·42		
		Depth of framing ..	8	8	8½	9	9½		
		Bulb angle frames..	9 ×3 ×·42 18 85	9 ×3 ×·50 20·20	9½ ×3½ ×·48 22·30	10 ×3½ ×·46 24·85	10½ ×3½ ×·46 24·50		
22	24	Frames	6 ×3 ×·38	6 ×3 ×·40	6 ×3 ×·40	6 ×3 ×·42	6½ ×3 ×·44	6½ ×3 ×·44	
		Reversed frames ..	5½ ×3½ ×·38	5½ ×3½ ×·40	6 ×3½ ×·40	6 ×3½ ×·42	6 ×3½ ×·44	6½ ×3½ ×·44	
		Depth of framing ..	8½	8½	9	9	9½	10	
		Bulb angle frames..	9½ ×3½ ×·44 21·34	9½ ×3½ ×·48 22·30	10 ×3½ ×·46 24·35	10 ×3½ ×·50 25·35	10½ ×3½ ×·48 28 0	10½ ×3½ ×·58 30·5	
23	24½	Frames	6 ×3 ×·42	6 ×3 ×·42	6½ ×3 ×·42				
		Reversed frames ..	5½ ×3½ ×·42	6 ×3½ ×·42	6 ×3½ ×·42				
		Depth of framing ..	8½	9	9½				
		Bulb angle frames..	9½ ×3½ ×·52 23·20	10 ×3½ ×·50 25·35	10½ ×3½ ×·46 27·3				

SIDE FRAMING. Standard Height TABLE 2A

FULL SCANTLING SINGLE DECK VESSELS WITH 100 PER CENT. SUPERSTRUCTURES. (SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.				
				Feet. 20	Feet. 21	Feet. 22	Feet. 23	Feet. 24
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
24	25	Frames..	$4\frac{1}{2}\times3\times\cdot36$	$6\times3\times\cdot42$	$6\frac{1}{2}\times3\times\cdot42$	$6\frac{1}{2}\times3\times\cdot42$	$6\frac{1}{2}\times3\times\cdot46$	
		Reversed frames ..	$3\times3\times\cdot36$	$6\times3\frac{1}{2}\times\cdot42$	$6\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	
		Depth of framing ..	5	9	$9\frac{1}{2}$	10	10	
		Bulb angle frames..	$6\frac{1}{2}\times3\times\cdot44$ 9.35	$10\times3\frac{1}{2}\times\cdot50$ 25.35	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 27.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 29.0	$11\times3\frac{1}{2}\times\cdot50$ 31.4	
25	$25\frac{1}{2}$	Frames..	$5\times3\times\cdot34$		$6\frac{1}{2}\times3\times\cdot42$	$6\frac{1}{2}\times3\times\cdot46$	$7\times3\times\cdot46$	$7\times3\times\cdot46$
		Reversed frames ..	$3\times3\times\cdot34$		$6\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot46$
		Depth of framing ..	$5\frac{1}{2}$		10	10	$10\frac{1}{2}$	11
		Bulb angle frames..	$7\times3\times\cdot36$ 10.10		$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 29.0	$11\times3\frac{1}{2}\times\cdot50$ 31.4	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 34.1	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 35.8
26	26	Frames..	$5\times3\times\cdot36$			$7\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot48$
		Reversed frames ..	$3\times3\times\cdot36$			$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot48$
		Depth of framing ..	$5\frac{1}{2}$			$10\frac{1}{2}$	11	11
		Bulb angle frames..	$7\times3\times\cdot40$ 10.6			$11\times3\frac{1}{2}\times\cdot54$ 32.4	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 34.4	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot60$ 34.3
27	$26\frac{1}{2}$	Frames..	$5\times3\times\cdot38$				$7\times3\frac{1}{2}\times\cdot48$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$
		Reversed frames ..	$3\frac{1}{2}\times3\times\cdot38$				$7\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$
		Depth of framing ..	$5\frac{1}{2}$				11	$11\frac{1}{2}$
		Bulb angle frames..	$7\times3\times\cdot44$ 11.0				$11\frac{1}{2}\times3\frac{1}{2}\times\cdot60$ 34.3	$12\times3\frac{1}{2}\times\cdot56$ 39.5
28	27	Frames..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot36$					$8\times3\frac{1}{2}\times\cdot48$
		Reversed frames ..	$3\times3\times\cdot36$					$7\times3\frac{1}{2}\times\cdot48$
		Depth of framing ..	6					12
		Bulb angle frames..	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot36$ 11.8				39.5	$12\times3\frac{1}{2}\times\cdot66$ 42.1
29	$27\frac{1}{2}$	Frames..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot38$					
		Reversed frames ..	$3\frac{1}{2}\times3\times\cdot38$					
		Depth of framing ..	6					
		Bulb angle frames..	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot40$ 12.3					12 × 3½ × 3½ × 52 C 44.6
30	28	Frames..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot40$					
		Reversed frames ..	$3\frac{1}{2}\times3\times\cdot40$					
		Depth of framing ..	6					
		Bulb angle frames..	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot44$ 12.8					

SIDE FRAMING. Standard Heights TABLE 2A

FULL SCANTLING SINGLE DECK VESSELS WITH 100 PER CENT. SUPERSTRUCTURES. (CONCLUDED.)

D	FRAME SPACING.	TYPE OF SPACING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO DECK AT SIDE.					
			Feet. 25	Feet. 26	Feet. 27	Feet. 28	Feet. 29	Feet. 30
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
24	25	Frames..						
		Reversed frames ..						
		Depth of framing ..						
		Bulb angle frames..						
25	$25\frac{1}{2}$	Frames..						
		Reversed frames ..						
		Depth of framing ..						
		Bulb angle frames..						
26	26	Frames..	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$					
		Reversed frames ..	$7 \times 3\frac{1}{2} \times \cdot 48$					
		Depth of framing ..	$11\frac{1}{2}$					
		Bulb angle frames..	$12 \times 3\frac{1}{2} \times \cdot 56$ 39.5					
27	$26\frac{1}{2}$	Frames..	$8 \times 3\frac{1}{2} \times \cdot 48$	$8 \times 3\frac{1}{2} \times \cdot 48$				
		Reversed frames ..	$7 \times 3\frac{1}{2} \times \cdot 48$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$				
		Depth of framing ..	12	$12\frac{1}{2}$				
		Bulb angle or Channel frames	$12 \times 3\frac{1}{2} \times \cdot 66$ 42.1	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 44.6				
28	27	Frames..	$8 \times 3\frac{1}{2} \times \cdot 48$	$8 \times 3\frac{1}{2} \times \cdot 48$	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$			
		Reversed frames ..	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	$8 \times 3\frac{1}{2} \times \cdot 48$	$8 \times 3\frac{1}{2} \times \cdot 48$			
		Depth of framing ..	$12\frac{1}{2}$	13	$13\frac{1}{2}$			
		Channel frames ..	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 44.6	$12 \times 4 \times 4 \times \cdot 50$ 46.8	$12 \times 4 \times 4 \times \cdot 58$ 50.1			
29	$27\frac{1}{2}$	Frames..	$8 \times 3\frac{1}{2} \times \cdot 48$	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	$9 \times 4 \times \cdot 48$	$9 \times 4 \times \cdot 52$		
		Reversed frames ..	$8 \times 3\frac{1}{2} \times \cdot 48$	$8 \times 3\frac{1}{2} \times \cdot 48$	$8 \times 3\frac{1}{2} \times \cdot 48$	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$		
		Depth of framing ..	13	$13\frac{1}{2}$	14	14		
		Channel frames ..	$12 \times 4 \times 4 \times \cdot 50$ 46.8	$12 \times 4 \times 4 \times \cdot 58$ 50.10	$13 \times 4 \times 4 \times \cdot 50$ 52.6	$13 \times 4 \times 4 \times \cdot 58$ 56.5		
30	28	Frames..		$9 \times 4 \times \cdot 48$	$9 \times 4 \times \cdot 52$	$9 \times 4 \times \cdot 54$	$9 \times 4 \times \cdot 58$	
		Reversed frames ..		$8 \times 3\frac{1}{2} \times \cdot 48$	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$	
		Depth of framing ..		14	14	14	14	
		Channel frames ..	49.0	$13 \times 4 \times 4 \times \cdot 50$ 52.6	$13 \times 4 \times 4 \times \cdot 58$ 56.5	$13 \times 4 \times 4 \times \cdot 62$ 58.5	$14 \times 4 \times 4 \times \cdot 56$ 61.9	

51.2. 55.1.

SIDE FRAMING.

FULL SCANTLING VESSELS—FLUSH DECK.

TABLE 3

(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.						
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14	Feet. 15	Feet. 16
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
18	23	Frames	$3\frac{1}{2}\times2\frac{1}{2}\times\cdot26$	$3\frac{1}{2}\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot30$					
		Reversed frames..	$3\times2\frac{1}{2}\times\cdot26$	$3\times2\frac{1}{2}\times\cdot30$	$3\times3\times\cdot30$					
		Depth of framing	4	4	4					
		Angle or bulb angle frames	$6\times3\times\cdot38$ 4·53	$5\times3\times\cdot36$ 5·0	$5\frac{1}{2}\times3\times\cdot34$ 5·9					
19	$23\frac{1}{2}$	Frames	$3\frac{1}{2}\times3\times\cdot28$	$3\frac{1}{2}\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot32$				
		Reversed frames..	$3\times2\frac{1}{2}\times\cdot28$	$3\times3\times\cdot30$	$3\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot32$				
		Depth of framing	4	4	4	$4\frac{1}{2}$				
		Angle or bulb angle frames	$6\frac{1}{2}\times3\times\cdot34$ 4·72	$5\frac{1}{2}\times3\times\cdot34$ 5·95	$5\frac{1}{2}\times3\times\cdot40$ 6·40	$6\times3\times\cdot38$ 7·3				
20	$23\frac{1}{2}$	Frames	$3\frac{1}{2}\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot30$	$4\times3\times\cdot30$	$4\times3\times\cdot34$			
		Reversed frames..	$3\times2\frac{1}{2}\times\cdot30$	$3\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot34$			
		Depth of framing	4	4	$4\frac{1}{2}$	5	5			
		Angle or bulb angle frames	$6\frac{1}{2}\times3\times\cdot36$ 5·0	$5\frac{1}{2}\times3\times\cdot40$ 6·4	$6\times3\times\cdot32$ 7·0	$6\times3\times\cdot44$ 7·95	$6\frac{1}{2}\times3\times\cdot38$ 8·75			
21	24	Frames	$3\frac{1}{2}\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot32$	$4\times3\times\cdot32$	$4\times3\times\cdot36$	$4\times3\times\cdot34$		
		Reversed frames..	$3\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot34$		
		Depth of framing	4	$4\frac{1}{2}$	$4\frac{1}{2}$	5	5	$5\frac{1}{2}$		
		Bulb angle frames	$5\frac{1}{2}\times3\times\cdot34$ 5·95	$6\times3\times\cdot32$ 7·0	$6\times3\times\cdot38$ 7·5	$6\frac{1}{2}\times3\times\cdot34$ 8·30	$6\frac{1}{2}\times3\times\cdot44$ 9·35	$7\times3\times\cdot36$ 10·10		
22	24	Frames	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot36$	$4\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot32$	$4\frac{1}{2}\times3\times\cdot36$	
		Reversed frames..	$3\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot36$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot34$	$4\times3\times\cdot32$	$4\times3\times\cdot36$	
		Depth of framing	4	$4\frac{1}{2}$	$4\frac{1}{2}$	5	$5\frac{1}{2}$	6	6	
		Bulb angle frames	$5\frac{1}{2}\times3\times\cdot40$ 6·4	$6\times3\times\cdot38$ 7·75	$6\frac{1}{2}\times3\times\cdot32$ 8·15	$6\frac{1}{2}\times3\times\cdot44$ 9·35	$7\times3\times\cdot36$ 10·10	$7\times3\times\cdot40$ 10·6	$7\frac{1}{2}\times3\times\cdot36$ 11·8	
23	$24\frac{1}{2}$	Frames	$3\frac{1}{2}\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot34$	$4\times3\times\cdot34$	$4\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot36$
		Reversed frames..	$3\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot36$	$3\frac{1}{2}\times3\times\cdot34$	$4\times3\times\cdot34$	$4\times3\times\cdot36$	$4\times3\times\cdot36$	$4\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot36$
		Depth of framing	4	$4\frac{1}{2}$	5	$5\frac{1}{2}$	$5\frac{1}{2}$	6	6	$6\frac{1}{2}$
		Bulb angle frames	$6\times3\times\cdot30$ 6·8	$6\frac{1}{2}\times3\times\cdot32$ 8·15	$6\frac{1}{2}\times3\times\cdot38$ 8·75	$7\times3\times\cdot36$ 10·10	$7\times3\times\cdot40$ 10·6	$7\frac{1}{2}\times3\times\cdot36$ 11·8	$7\frac{1}{2}\times3\times\cdot36$ 11·8	$7\frac{1}{2}\times3\times\cdot46$ 13·05
24	25	Frames	$4\times3\times\cdot32$	$4\times3\times\cdot34$	$4\times3\times\cdot36$	$4\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot36$	$5\times3\times\cdot36$
		Reversed frames..	$3\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot36$	$4\times3\times\cdot34$	$4\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot36$
		Depth of framing	$4\frac{1}{2}$	5	5'	$5\frac{1}{2}$	6	6	$6\frac{1}{2}$	7
		Bulb angle frames	$6\times3\times\cdot38$ 7·5	$6\frac{1}{2}\times3\times\cdot38$ 8·75	$6\frac{1}{2}\times3\times\cdot44$ 9·35	$7\times3\times\cdot40$ 10·6	$7\times3\times\cdot46$ 11·2	$7\frac{1}{2}\times3\times\cdot36$ 11·8	$7\frac{1}{2}\times3\times\cdot46$ 13·05	$8\times3\times\cdot42$ 14·5
25	$25\frac{1}{2}$	Frames	$4\times3\times\cdot34$	$4\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot36$	$5\times3\times\cdot40$	$5\times3\times\cdot38$
		Reversed frames..	$3\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot36$	$3\frac{1}{2}\times3\times\cdot34$	$4\times3\times\cdot34$	$4\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot40$	$5\times3\times\cdot38$
		Depth of framing	$4\frac{1}{2}$	5	$5\frac{1}{2}$	6	6	$6\frac{1}{2}$	$6\frac{1}{2}$	7
		Bulb angle frames	$6\times3\times\cdot42$ 7·9	$6\frac{1}{2}\times3\times\cdot44$ 9·35	$7\times3\times\cdot36$ 10·10	$7\times3\times\cdot46$ 11·2	$7\frac{1}{2}\times3\times\cdot36$ 11·8	$7\frac{1}{2}\times3\times\cdot46$ 13·05	$8\times3\times\cdot40$ 14·15	$8\times3\times\cdot46$ 15·0

SIDE FRAMING.

FULL SCANTLING VESSELS—FLUSH DECK.

TABLE 3
(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.									
			Feet. 17	Feet. 18	Feet.	Feet. 20	Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25
Feet.	Inches.					Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
25	$25\frac{1}{2}$	Depth of framing	$7\frac{1}{2}$			$7\frac{1}{2}$					
		Bulb angle frames	$8\frac{1}{2} \times 3 \times \cdot44$			$8\frac{1}{2} \times 3 \times \cdot52$					

d : 8'0 is allowed.
Rooms permanent coal Bunkers
are to be increased ·06 in thickness
gles eqt spacing round knuckle
more than 30".
same thickness as frames.
+ breadth
thickness : 3 times depth of plate
es (for 8'-6" 'tween deck height)
nged where flange is excessive
Plate

m 18" for BP frames } see below.
12" " angles.
gs to suit riveting.
deck height exceeds 9'0" is to be
w ratio may be reduced when
" in ratio to 8'0"
& cut frames also increased.
ased ½" in depth
ch spacing is less than
are required care to be taken
g forward of the B/S is not
forward of the Rules
m deck frames
depth of lower dk frame + 1"
of margin ÷ 3
ges above 7" BPs
" for 7" BAs & under.

Overlap of main frames at Bilge : 2½ Times the
depth of the main frame
Channels may be considered as equal to
bulb angles + 1" in depth.

5 × 3 × ·42

16·45 15·0

FORM OF REQUEST FOR REPORTS, TRACINGS, &c.

N.B.—This form is to be filled up in every instance where reports, &c., are required, and to be handed to the Custodian thereof, and retained by him.

Name of Vessel.....

State nature of documents.....

Port.....

Date of build.....

Required by.....
(Name in full)

Report No.....

Date.....

5m.11.46.

SIDE FRAMING.

FULL SCANTLING VESSELS—FLUSH DECK.

TABLE 3

(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.							
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14	Feet. 15	Feet. 16	Feet. 17
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
26	26	Frames	4 × 3 × ·36	4½ × 3½ × ·34	4½ × 3½ × ·36	4½ × 3½ × ·36	4½ × 3½ × ·38	5 × 3½ × ·38	5 × 3½ × ·40	5 × 3½ × ·40	5 × 3½ × ·40
		Reversed frames..	3 × 3 × ·36	3 × 3½ × ·34	3 × 3½ × ·36	3½ × 3½ × ·36	4 × 3½ × ·38	4 × 3½ × ·38	4 × 3½ × ·40	4½ × 3½ × ·40	5 × 3½ × ·40
		Depth of framing	4½	5	5	5½	5½	6	6	6½	7
		Bulb angle frames	6½ × 3 × ·32	7 × 3½ × ·36	7 × 3½ × ·40	7½ × 3½ × ·36	7½ × 3½ × ·40	8 × 3½ × ·38	8 × 3½ × ·42	8 × 3½ × ·50	8½ × 3½ × ·48
			8·15	10·10	10·6	11·8	12·3	13·85	14·45	15·7	17·52
27	26½	Frames	4½ × 3 × ·34	4½ × 3½ × ·36	4½ × 3½ × ·36	4½ × 3½ × ·38	4½ × 3½ × ·42	5 × 3½ × ·40	5 × 3½ × ·40	5 × 3½ × ·40	5 × 3½ × ·44
		Reversed frames..	3 × 3 × ·34	3 × 3½ × ·36	3½ × 3½ × ·36	4 × 3½ × ·38	4 × 3½ × ·42	4 × 3½ × ·40	4½ × 3½ × ·40	5 × 3½ × ·40	5 × 3½ × ·44
		Depth of framing	5	5	5½	5½	5½	6	6½	7	7
		Bulb angle frames	6½ × 3 × ·38	7 × 3½ × ·40	7½ × 3½ × ·36	7½ × 3½ × ·40	7½ × 3½ × ·48	8 × 3½ × ·42	8 × 3½ × ·50	8½ × 3½ × ·48	9 × 3½ × ·42
			8·75	10·6	11·8	12·3	13·4	14·45	15·7	17·52	18·55
28	27	Frames	4½ × 3 × ·36	5 × 3½ × ·36	5 × 3½ × ·38	5 × 3½ × ·42	5 × 3½ × ·40	5 × 3½ × ·42	5 × 3½ × ·42	5 × 3½ × ·42	5½ × 3½ × ·42
		Reversed frames..	3 × 3 × ·36	3 × 3½ × ·36	3½ × 3½ × ·38	3½ × 3½ × ·42	4 × 3½ × ·40	4 × 3½ × ·42	4½ × 3½ × ·42	5 × 3½ × ·42	5 × 3½ × ·42
		Depth of framing	5	5½	5½	5½	6	6	6½	7	7½
		Bulb angle frames	6½ × 3 × ·44	7½ × 3½ × ·36	7½ × 3½ × ·40	7½ × 3½ × ·48	8 × 3½ × ·42	8 × 3½ × ·46	8½ × 3½ × ·42	8½ × 3½ × ·52	9 × 3½ × ·48
			9·35	11·8	12·3	13·4	14·45	15·05	16·5	18·2	19·85
29	27½	Frames	5 × 3 × ·36	5 × 3½ × ·38	5 × 3½ × ·40	5 × 3½ × ·40	5 × 3½ × ·42	5 × 3½ × ·40	5 × 3½ × ·40	5 × 3½ × ·44	5½ × 3½ × ·44
		Reversed frames..	3 × 3 × ·36	3½ × 3½ × ·38	3½ × 3½ × ·40	4 × 3½ × ·40	4 × 3½ × ·42	4½ × 3½ × ·40	5 × 3½ × ·40	5 × 3½ × ·44	5 × 3½ × ·44
		Depth of framing	5½	5½	5½	6	6	6½	7	7	7½
		Bulb angle frames	7 × 3 × ·40	7½ × 3½ × ·40	7½ × 3½ × ·44	8 × 3½ × ·42	8 × 3½ × ·46	8 × 3½ × ·50	8½ × 3½ × ·48	9 × 3½ × ·42	9 × 3½ × ·52
			10·6	12·3	12·9	14·45	15·05	15·4	17·52	18·85	20·55
30	28	Frames	5½ × 3 × ·38	5 × 3½ × ·42	5 × 3½ × ·38	5 × 3½ × ·42	5 × 3½ × ·40	5 × 3½ × ·38	5 × 3½ × ·42	5½ × 3½ × ·42	5½ × 3½ × ·46
		Reversed frames..	3 × 3 × ·38	3½ × 3½ × ·42	4 × 3½ × ·38	4 × 3½ × ·42	4½ × 3½ × ·40	5 × 3½ × ·38	5 × 3½ × ·42	5 × 3½ × ·42	5 × 3½ × ·46
		Depth of framing	5½	5½	6	6	6½	7	7	7½	7½
		Bulb angle frames	7 × 3 × ·44	7½ × 3½ × ·48	7½ × 3½ × ·50	8 × 3½ × ·46	8 × 3½ × ·50	8½ × 3½ × ·42	8½ × 3½ × ·52	9 × 3½ × ·48	9½ × 3½ × ·44
			11·0	13·4	13·4	15·05	15·4	16·5	18·2	19·85	21·35
31	28½	Frames	5½ × 3 × ·40	5½ × 3½ × ·40	5½ × 3½ × ·42	5½ × 3½ × ·40	5½ × 3½ × ·42	5½ × 3½ × ·40	5½ × 3½ × ·40	5½ × 3½ × ·44	6 × 3½ × ·44
		Reversed frames..	3 × 3 × ·40	3½ × 3½ × ·40	3½ × 3½ × ·42	4 × 3½ × ·40	4 × 3½ × ·42	4½ × 3½ × ·40	5 × 3½ × ·40	5 × 3½ × ·44	5 × 3½ × ·44
		Depth of framing	5½	6	6	6½	6½	7	7½	7½	8
		Bulb angle frames	7½ × 3 × ·36	8 × 3½ × ·42	8 × 3½ × ·46	8 × 3½ × ·50	8½ × 3½ × ·42	8½ × 3½ × ·48	9 × 3½ × ·44	9 × 3½ × ·52	9½ × 3½ × ·48
			11·8	14·45	15·05	15·4	16·5	17·52	19·2	20·55	22·30
32	29	Frames	5½ × 3 × ·42	5½ × 3½ × ·42	5½ × 3½ × ·44	5½ × 3½ × ·42	5½ × 3½ × ·40	5½ × 3½ × ·44	5½ × 3½ × ·42	5½ × 3½ × ·46	6 × 3½ × ·46
		Reversed frames..	3 × 3 × ·42	3½ × 3½ × ·42	3½ × 3½ × ·44	4 × 3½ × ·42	4½ × 3½ × ·40	4½ × 3½ × ·44	5 × 3½ × ·42	5 × 3½ × ·46	5 × 3½ × ·46
		Depth of framing	5½	6	6	6½	7	7	7½	7½	8
		Bulb angle frames	7½ × 3 × ·38	8 × 3½ × ·46	8 × 3½ × ·50	8½ × 3½ × ·42	8½ × 3½ × ·48	9 × 3½ × ·42	9 × 3½ × ·48	9½ × 3½ × ·44	9½ × 3½ × ·52
			12·05	15·05	15·4	16·5	17·52	18·85	19·85	2·35	23·20

SIDE FRAMING.

FULL SCANTLING VESSELS—FLUSH DECK.

TABLE 3

(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.							
			Feet. 18	Feet. 19	Feet. 20	Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
26	26	Frames	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$						
		Reversed frames..	$5\times3\frac{1}{2}\times\cdot40$	$5\times3\frac{1}{2}\times\cdot44$						
		Depth of framing	$7\frac{1}{2}$	$7\frac{1}{2}$						
		Bulb angle frames	$9\times3\frac{1}{2}\times\cdot44$ 19.2	$9\times3\frac{1}{2}\times\cdot52$ 20.55						
27	$26\frac{1}{2}$	Frames	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot44$					
		Reversed frames..	$5\times3\frac{1}{2}\times\cdot44$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$					
		Depth of framing	$7\frac{1}{2}$	8	$8\frac{1}{2}$					
		Bulb angle frames	$9\times3\frac{1}{2}\times\cdot52$ 20.55	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 22.3	$10\times3\frac{1}{2}\times\cdot46$ 24.35					
28	27	Frames	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot46$				
		Reversed frames..	$5\times3\frac{1}{2}\times\cdot46$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot46$				
		Depth of framing	$7\frac{1}{2}$	8	$8\frac{1}{2}$	9				
		Bulb angle frames	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot44$ 21.35	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 23.2	$10\times3\frac{1}{2}\times\cdot50$ 23.35	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 24.5				
29	$27\frac{1}{2}$	Frames	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$			
		Reversed frames..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$			
		Depth of framing	8	$8\frac{1}{2}$	9	$9\frac{1}{2}$	10			
		Bulb angle frames	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 22.3	$10\times3\frac{1}{2}\times\cdot46$ 24.35	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 24.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 29.5	$11\times3\frac{1}{2}\times\cdot50$ 31.4			
30	28	Frames	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot44$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$		
		Reversed frames..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot48$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$		
		Depth of framing	8	9	$9\frac{1}{2}$	$9\frac{1}{2}$	10	$10\frac{1}{2}$		
		Bulb angle frames	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 23.2	$10\times3\frac{1}{2}\times\cdot54$ 26.30	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 29.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 30.5	$11\times3\frac{1}{2}\times\cdot56$ 32.9	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 34.4		
31	$28\frac{1}{2}$	Frames	$6\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	
		Reversed frames..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$	
		Depth of framing	$8\frac{1}{2}$	9	$9\frac{1}{2}$	10	$10\frac{1}{2}$	11	$11\frac{1}{2}$	
		Bulb angle frames	$10\times3\frac{1}{2}\times\cdot46$ 24.35	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 27.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 29.5	$11\times3\frac{1}{2}\times\cdot50$ 31.4	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 34.7	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot60$ 37.3	$12\times3\frac{1}{2}\times\cdot56$ 39.6	
32	29	Frames	$6\times3\frac{1}{2}\times\cdot44$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot52$
		Reversed frames..	$6\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot48$	$6\times3\frac{1}{2}\times\cdot48$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot52$
		Depth of framing	9	$9\frac{1}{2}$	$9\frac{1}{2}$	10	$10\frac{1}{2}$	11	$11\frac{1}{2}$	12
		Bulb angle or channel frames	$10\times3\frac{1}{2}\times\cdot54$ 26.30	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 28.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 30.5	$11\times3\frac{1}{2}\times\cdot56$ 32.9	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 36.3	$12\times3\frac{1}{2}\times\cdot52$ 38.3	$12\times3\frac{1}{2}\times\cdot62$ 41.1	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 45.4

SIDE FRAMING.

FULL SCANTLING VESSELS—FLUSH DECK.

TABLE 3

(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.				
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
33	$29\frac{1}{2}$	Frames	$6 \times 3 \times \cdot 40$	$6 \times 3\frac{1}{2} \times \cdot 40$	$6 \times 3\frac{1}{2} \times \cdot 42$	$6 \times 3\frac{1}{2} \times \cdot 40$	$6 \times 3\frac{1}{2} \times \cdot 42$	$6 \times 3\frac{1}{2} \times \cdot 42$
		Reversed frames ..	$3 \times 3 \times \cdot 40$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$4 \times 3\frac{1}{2} \times \cdot 40$	$4 \times 3\frac{1}{2} \times \cdot 42$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$
		Depth of framing ..	6	$6\frac{1}{2}$	$6\frac{1}{2}$	7	7	$7\frac{1}{2}$
		Bulb angle frames..	$7\frac{1}{2} \times 3 \times \cdot 44$ 12.8	$8 \times 3\frac{1}{2} \times \cdot 50$ 15.7	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$ 16.5	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 17.2	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 18.2	$9 \times 3\frac{1}{2} \times \cdot 48$ 19.35
34	30	Frames	$6 \times 3 \times \cdot 40$	$6 \times 3\frac{1}{2} \times \cdot 40$	$6 \times 3\frac{1}{2} \times \cdot 42$	$6 \times 3\frac{1}{2} \times \cdot 40$	$6 \times 3\frac{1}{2} \times \cdot 42$	$6 \times 3\frac{1}{2} \times \cdot 40$
		Reversed frames ..	$3\frac{1}{2} \times 3 \times \cdot 40$	$4 \times 3\frac{1}{2} \times \cdot 40$	$4 \times 3\frac{1}{2} \times \cdot 42$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$5 \times 3\frac{1}{2} \times \cdot 40$
		Depth of framing ..	$6\frac{1}{2}$	7	7	$7\frac{1}{2}$	$7\frac{1}{2}$	8
		Bulb angle frames..	$8 \times 3 \times \cdot 40$ 14.15	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 17.52	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 18.2	$9 \times 3\frac{1}{2} \times \cdot 44$ 19.2	$9 \times 3\frac{1}{2} \times \cdot 48$ 19.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$ 20.85
35	$30\frac{1}{2}$	Frames	$6\frac{1}{2} \times 3 \times \cdot 40$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$
		Reversed frames ..	$3\frac{1}{2} \times 3 \times \cdot 40$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$4 \times 3\frac{1}{2} \times \cdot 40$	$4 \times 3\frac{1}{2} \times \cdot 42$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$
		Depth of framing ..	7	7	$7\frac{1}{2}$	$7\frac{1}{2}$	8	8
		Bulb angle frames..	$8\frac{1}{2} \times 3 \times \cdot 40$ 16.15	$8\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 18.2	$9 \times 3\frac{1}{2} \times \cdot 44$ 19.2	$9 \times 3\frac{1}{2} \times \cdot 48$ 19.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$ 20.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 21.85
36	31	Frames	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$
		Reversed frames ..	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$4 \times 3\frac{1}{2} \times \cdot 40$	$4 \times 3\frac{1}{2} \times \cdot 42$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$
		Depth of framing ..	7	$7\frac{1}{2}$	$7\frac{1}{2}$	8	8	8
		Bulb angle frames..	$9 \times 3\frac{1}{2} \times \cdot 40$ 18.5	$9 \times 3\frac{1}{2} \times \cdot 44$ 19.2	$9 \times 3\frac{1}{2} \times \cdot 48$ 19.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$ 20.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 22.30	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 23.2
37	$31\frac{1}{2}$	Frames	$7 \times 3\frac{1}{2} \times \cdot 40$	$7 \times 3\frac{1}{2} \times \cdot 40$	$7 \times 3\frac{1}{2} \times \cdot 42$	$7 \times 3\frac{1}{2} \times \cdot 44$	$7 \times 3\frac{1}{2} \times \cdot 46$	$7 \times 3\frac{1}{2} \times \cdot 44$
		Reversed frames ..	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	$4 \times 3\frac{1}{2} \times \cdot 40$	$4 \times 3\frac{1}{2} \times \cdot 42$	$4 \times 3\frac{1}{2} \times \cdot 44$	$4 \times 3\frac{1}{2} \times \cdot 46$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$
		Depth of framing ..	$7\frac{1}{2}$	8	8	8	8	$8\frac{1}{2}$
		Bulb angle frames..	$9 \times 3\frac{1}{2} \times \cdot 44$ 19.2	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$ 20.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 21.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 22.3	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 23.2	$10 \times 3\frac{1}{2} \times \cdot 46$ 24.35
38	32	Frames	$7 \times 3\frac{1}{2} \times \cdot 42$	$7 \times 3\frac{1}{2} \times \cdot 42$	$7 \times 3\frac{1}{2} \times \cdot 44$	$7 \times 3\frac{1}{2} \times \cdot 46$	$7 \times 3\frac{1}{2} \times \cdot 46$	$7 \times 3\frac{1}{2} \times \cdot 44$
		Reversed frames ..	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$4 \times 3\frac{1}{2} \times \cdot 42$	$4 \times 3\frac{1}{2} \times \cdot 44$	$4 \times 3\frac{1}{2} \times \cdot 46$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	$5 \times 3\frac{1}{2} \times \cdot 44$
		Depth of framing ..	$7\frac{1}{2}$	8	8	8	$8\frac{1}{2}$	9
		Bulb angle frames..	$9 \times 3\frac{1}{2} \times \cdot 48$ 19.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 21.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 22.3	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 23.2	$10 \times 3\frac{1}{2} \times \cdot 50$ 25.35	$10 \times 3\frac{1}{2} \times \cdot 54$ 26.3
39	$32\frac{1}{2}$	Frames	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	$7\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$
		Reversed frames ..	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	$4 \times 3\frac{1}{2} \times \cdot 46$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$
		Depth of framing ..	8	8	8	$8\frac{1}{2}$	9	9
		Bulb angle frames..	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 21.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 22.3	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 23.2	$10 \times 3\frac{1}{2} \times \cdot 50$ 25.35	$10 \times 3\frac{1}{2} \times \cdot 54$ 26.3	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 28.0

SIDE FRAMING.

FULL SCANTLING VESSELS—FLUSH DECK.

TABLE 3

(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.					
			Feet. 15	Feet. 16	Feet. 17	Feet. 18	Feet. 19	Feet. 20
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
33	29½	Frames	6 × 3½ × ·42	6 × 3½ × ·46	6 × 3½ × ·46	6 × 3½ × ·46	6½ × 3½ × ·46	6½ × 3½ × ·46
		Reversed frames ..	5 × 3½ × ·42	5 × 3½ × ·46	5½ × 3½ × ·46	6 × 3½ × ·46	6 × 3½ × ·46	6½ × 3½ × ·46
		Depth of framing..	8	8	8½	9	9½	10
		Bulb angle frames..	9½ × 3½ × ·46	9½ × 3½ × ·52	10 × 3½ × ·50	10½ × 3½ × ·46	10½ × 3½ × ·54	11 × 3½ × ·50
			24. 85	23 2	25 35	24 · 25	29. 5	31. 4
34	30	Frames	6 × 3½ × ·44	6 × 3½ × ·48	6 × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·50
		Reversed frames ..	5 × 3½ × ·44	5 × 3½ × ·48	5½ × 3½ × ·48	6 × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·50
		Depth of framing..	8	8	8½	9	9½	10
		Bulb angle frames..	9½ × 3½ × ·48	10 × 3½ × ·46	10 × 3½ × ·54	10½ × 3½ × ·50	10½ × 3½ × ·58	11½ × 3½ × ·48
			22. 3	24 · 35	26. 3	28. 5	30. 5	34. 1.
35	30½	Frames	6½ × 3½ × ·46	6½ × 3½ × ·46	6½ × 3½ × ·46	6½ × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48
		Reversed frames ..	4½ × 3½ × ·46	5 × 3½ × ·46	5½ × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48
		Depth of framing..	8	8½	9	9½	10	10½
		Bulb angle frames..	9½ × 3½ × ·52	10 × 3½ × ·50	10½ × 3½ × ·46	10½ × 3½ × ·58	11 × 3½ × ·56	11½ × 3½ × ·50
			23. 2	25. 35	27 5	30. 5	32. 9.	34. 4.
36	31	Frames	6½ × 3½ × ·46	6½ × 3½ × ·48	6½ × 3½ × ·50	6½ × 3½ × ·50	6½ × 3½ × ·50	7 × 3½ × ·50
		Reversed frames ..	5 × 3½ × ·46	5 × 3½ × ·48	5½ × 3½ × ·50	6 × 3½ × ·50	6½ × 3½ × ·50	6½ × 3½ × ·50
		Depth of framing..	8½	8½	9	9½	10	10½
		Bulb angle frames..	10 × 3½ × ·50	10 × 3½ × ·54	10½ × 3½ × ·54	11 × 3½ × ·50	11½ × 3½ × ·48	11½ × 3½ × ·56
			25. 35	26. 3	29. 5	31. 4	34. 1.	36. 7.
37	31½	Frames	7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·50	7 × 3½ × ·50
		Reversed frames ..	4½ × 3½ × ·48	5 × 3½ × ·48	5½ × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·50	7 × 3½ × ·50
		Depth of framing..	8½	9	9½	10	10½	11
		Bulb angle frames..	10 × 3½ × ·54	10½ × 3½ × ·50	10½ × 3½ × ·58	11 × 3½ × ·56	11½ × 3½ × ·56	12 × 3½ × ·52
			26. 3	28 5	30 · 5	32. 9	36. 3	38. 3
38	32	Frames	7 × 3½ × ·48	7½ × 3½ × ·46	7½ × 3½ × ·50	7½ × 3½ × ·50	7½ × 3½ × ·52	7½ × 3½ × ·52
		Reversed frames ..	5 × 3½ × ·48	5 × 3½ × ·46	5 × 3½ × ·50	5½ × 3½ × ·50	6½ × 3½ × ·52	7 × 3½ × ·52
		Depth of framing..	9	9½	9½	10	10½	11
		Bulb angle frames..	10½ × 3½ × ·50	10½ × 3½ × ·54	11 × 3½ × ·50	11½ × 3½ × ·48	11½ × 3½ × ·60	12 × 3½ × ·56
			28. 5	29. 5	31 4	34 1	37. 3.	39. 5
39	32½	Frames	8 × 3½ × ·46	8 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·50
		Reversed frames ..	4½ × 3½ × ·46	4½ × 3½ × ·48	5 × 3½ × ·48	5½ × 3½ × ·48	6 × 3½ × ·50	6½ × 3½ × ·50
		Depth of framing..	9½	9½	10	10½	11	11½
		Bulb angle frames..	10½ × 3½ × ·54	10½ × 3½ × ·58	11 × 3½ × ·56	11½ × 3½ × ·50	12 × 3½ × ·52	12 × 3½ × ·62
			29. 5	30 · 5	32 · 9	34 · 4	38 3	41. 1.

SIDE FRAMING.

FULL SCANTLING VESSELS—FLUSH DECK.

TABLE 3

(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.					
			Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25	Feet. 26
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
33	29½	Frames	7 × 3½ × ·48	7½ × 3½ × ·48	7½ × 3½ × ·50	7½ × 3½ × ·50		
		Reversed frames ..	6½ × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·50	7½ × 3½ × ·50		
		Depth of framing ..	10½	11	11½	12		
		Bulb angle or channel frames	11½ × 3½ × ·50 34.4	11½ × 3½ × ·60 37.3	12 × 3½ × ·62 41.1	12 × 3½ × 3½ × ·52 43 8		
34	30	Frames	7 × 3½ × ·50	7½ × 3½ × ·50	7½ × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·54	
		Reversed frames ..	6½ × 3½ × ·50	6½ × 3½ × ·50	7½ × 3½ × ·52	7½ × 3½ × ·52	8 × 3½ × ·54	
		Depth of framing ..	10½	11	11½	12	12½	
		Bulb angle or channel frames	11½ × 3½ × ·56 36.3.	12 × 3½ × ·52 38 3	12 × 3½ × ·66 42.1	12 × 3½ × 3½ × ·56 45.4	12 × 4 × 4 × ·56 49.3	
35	30½	Frames	7 × 3½ × ·50	7½ × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52	8½ × 3½ × ·52	8½ × 3½ × ·52
		Reversed frames ..	7 × 3½ × ·50	7 × 3½ × ·50	7½ × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·52	8½ × 3½ × ·52
		Depth of framing ..	11	11½	12	12½	13	13½
		Bulb angle or channel frames	12 × 3½ × ·52 38 3	12 × 3½ × ·62 41 1	12 × 3½ × 3½ × ·56 45.4	12 × 4 × 4 × ·52 47. 6	12 × 4 × 4 × ·58 50 1	13 × 4 × 4 × ·52 53 6
36	31	Frames	7½ × 3½ × ·50	7½ × 3½ × ·52	8 × 3½ × ·54	8½ × 3½ × ·52	8½ × 3½ × ·52	8½ × 3½ × ·56
		Reversed frames ..	7 × 3½ × ·52	7½ × 3½ × ·52	7½ × 3½ × ·54	8 × 3½ × ·52	8½ × 3½ × ·52	8½ × 3½ × ·56
		Depth of framing ..	11	11½	12	13	13½	13½
		Bulb angle or channel frames	12 × 3½ × ·56 39. 5	12 × 3½ × ·66 42.1	12 × 3½ × 3½ × ·58 46 2.	12 × 4 × 4 × ·58 50 1	13 × 4 × 4 × ·52 53 6	13 × 4 × 4 × ·58 56 5
37	31½	Frames	7½ × 3½ × ·50	8 × 3½ × ·50	8½ × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·56	9 × 4 × ·56
		Reversed frames ..	7 × 3½ × ·50	7 × 3½ × ·50	7½ × 3½ × ·52	8 × 3½ × ·54	8½ × 3½ × ·56	8½ × 3½ × ·56
		Depth of framing ..	11½	12	12½	13	13½	14
		Bulb angle or channel frames	12 × 3½ × ·62 41.1	12 × 3½ × 3½ × ·52 43 9	12 × 4 × 4 × ·52 47.6	13 × 4 × 4 × ·50 52.6	13 × 4 × 4 × ·58 56 ·5	14 × 4 × 4 × ·52 59 7
38	32	Frames	7½ × 3½ × ·50	8 × 3½ × ·50	8½ × 3½ × ·52	8½ × 3½ × ·54	9 × 4 × ·54	9 × 4 × ·58
		Reversed frames ..	7½ × 3½ × ·50	7½ × 3½ × ·50	8 × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·54	8½ × 3½ × ·58
		Depth of framing ..	12	12½	13	13½	14	14
		Channel frames ..	12 × 3½ × 3½ × ·52 43 8	12 × 3½ × 3½ × ·58 46 2	12 × 4 × 4 × ·58 50 1	13 × 4 × 4 × ·54 54. 5	13 × 4 × 4 × ·62 58 5	14 × 4 × 4 × ·56 61 9
39	32½	Frames	8 × 3½ × ·52	8 × 3½ × ·50	8½ × 3½ × ·54	8½ × 3½ × ·56	9 × 4 × ·56	9½ × 4 × ·54
		Reversed frames ..	7½ × 3½ × ·52	8 × 3½ × ·50	8 × 3½ × ·54	8½ × 3½ × ·56	8½ × 3½ × ·56	8½ × 4 × ·54
		Depth of framing ..	12	13	13	13½	14	14½
		Channel frames ..	12 × 3½ × 3½ × ·56 45.4	12 × 4 × 4 × ·54 48 5	13 × 4 × 4 × ·50 52 6	13 × 4 × 4 × ·58 56 5	14 × 4 × 4 × ·52 59 7	15 × 4 × 4 × ·52 65 9

SIDE FRAMING.

FULL SCANTLING VESSELS—FLUSH DECK.

TABLE 3

(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.				
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
40	33	Frames	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot44$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot44$
		Reversed frames ..	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$4\times3\frac{1}{2}\times\cdot44$	$4\times3\frac{1}{2}\times\cdot46$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot44$
		Depth of framing ..	8	8	$8\frac{1}{2}$	9	9	$9\frac{1}{2}$
		Bulb angle frames..	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 22.75	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 23.2	$10\times3\frac{1}{2}\times\cdot50$ 25.35	$10\times3\frac{1}{2}\times\cdot54$ 26.3	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 24.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 28.5
41	$33\frac{1}{2}$	Frames	$8\times3\frac{1}{2}\times\cdot44$	$8\times3\frac{1}{2}\times\cdot44$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot44$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot44$
		Reversed frames ..	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$4\times3\frac{1}{2}\times\cdot44$	$4\times3\frac{1}{2}\times\cdot46$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$5\times3\frac{1}{2}\times\cdot44$
		Depth of framing ..	$8\frac{1}{2}$	9	9	$9\frac{1}{2}$	$9\frac{1}{2}$	10
		Bulb angle frames..	$10\times3\frac{1}{2}\times\cdot46$ 24.35	$10\times3\frac{1}{2}\times\cdot54$ 26.3	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 24.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 28.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 29.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 30 5
42	34	Frames	$8\times3\frac{1}{2}\times\cdot44$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot46$
		Reversed frames ..	$4\times3\frac{1}{2}\times\cdot44$	$4\times3\frac{1}{2}\times\cdot46$	$4\times3\frac{1}{2}\times\cdot48$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$5\times3\frac{1}{2}\times\cdot46$
		Depth of framing ..	9	9	9	$9\frac{1}{2}$	$9\frac{1}{2}$	10
		Bulb angle frames..	$10\times3\frac{1}{2}\times\cdot54$ 26.3	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 24.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 28.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 29.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 30 5	$11\times3\frac{1}{2}\times\cdot50$ 31.4
43	$34\frac{1}{2}$	Frames	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot46$
		Reversed frames ..	$4\times3\frac{1}{2}\times\cdot46$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$5\times3\frac{1}{2}\times\cdot46$	$5\times3\frac{1}{2}\times\cdot48$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$
		Depth of framing ..	9	$9\frac{1}{2}$	$9\frac{1}{2}$	10	10	$10\frac{1}{2}$
		Bulb angle frames..	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 24.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 29.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 30.5	$11\times3\frac{1}{2}\times\cdot50$ 31.4	$11\times3\frac{1}{2}\times\cdot56$ 32.9	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 34.8
44	35	Frames	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot46$
		Reversed frames ..	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$5\times3\frac{1}{2}\times\cdot46$	$5\times3\frac{1}{2}\times\cdot48$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$6\times3\frac{1}{2}\times\cdot46$
		Depth of framing ..	$9\frac{1}{2}$	10	10	$10\frac{1}{2}$	$10\frac{1}{2}$	11
		Bulb angle frames..	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 29.5	$11\times3\frac{1}{2}\times\cdot50$ 31.4	$11\times3\frac{1}{2}\times\cdot56$ 32.9	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 34.1	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 34.7	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 35.8
45	$35\frac{1}{2}$	Frames	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot48$
		Reversed frames ..	$5\times3\frac{1}{2}\times\cdot46$	$5\times3\frac{1}{2}\times\cdot48$	$5\times3\frac{1}{2}\times\cdot50$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$6\times3\frac{1}{2}\times\cdot48$
		Depth of framing ..	10	10	10	$10\frac{1}{2}$	$10\frac{1}{2}$	11
		Bulb angle frames..	$11\times3\frac{1}{2}\times\cdot50$ 31.4	$11\times3\frac{1}{2}\times\cdot56$ 32.9	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 34.1	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 34.7	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 36.3	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot60$ 37.3
46	36	Frames	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot48$
		Reversed frames ..	$5\times3\frac{1}{2}\times\cdot48$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$6\times3\frac{1}{2}\times\cdot48$	$6\times3\frac{1}{2}\times\cdot50$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$
		Depth of framing ..	10	$10\frac{1}{2}$	$10\frac{1}{2}$	11	11	$11\frac{1}{2}$
		Bulb angle frames..	$11\times3\frac{1}{2}\times\cdot56$ 32.9	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 34.7	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 36.3	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot60$ 37.3	$12\times3\frac{1}{2}\times\cdot52$ 38.3	$12\times3\frac{1}{2}\times\cdot56$ 39.5

SIDE FRAMING.

FULL SCANTLING VESSELS—FLUSH DECK.

TABLE 3

(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS TO LOWEST DECK AT SIDE.					
			Feet. 15	Feet. 16	Feet. 17	Feet. 18	Feet. 19	Feet. 20
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
40	33	Frames	8 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·50
		Reversed frames ..	4½ × 3½ × ·48	5 × 3½ × ·48	5½ × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·50	7 × 3½ × ·50
		Depth of framing ..	9½	10	10½	11	11½	12
		Bulb angle or channel frames	10½ × 3½ × ·58 30·5	11 × 3½ × ·56 32·9	11½ × 3½ × ·50 34·5	11½ × 3½ × ·60 34·3	12 × 3½ × ·62 41·1	12 × 3½ × 3½ × ·52 43·8
41	33½	Frames	8 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·52	8 × 3½ × ·50
		Reversed frames ..	5 × 3½ × ·48	5 × 3½ × ·50	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·52	7½ × 3½ × ·50
		Depth of framing ..	10	10	11	11½	11½	12½
		Bulb angle or channel frames	11 × 3½ × ·56 32·9	11½ × 3½ × ·48 34·1	11½ × 3½ × ·60 34·3	12 × 3½ × ·56 39·5	12 × 3½ × ·66 42·1	12 × 3½ × 3½ × ·58 46·2
42	34	Frames	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52
		Reversed frames ..	5 × 3½ × ·50	5½ × 3½ × ·50	6 × 3½ × ·50	6½ × 3½ × ·50	7½ × 3½ × ·52	8 × 3½ × ·52
		Depth of framing ..	10	10½	11	11½	12	12½
		Bulb angle or channel frames	11½ × 3½ × ·48 34·1	11½ × 3½ × ·56 36·3	12 × 3½ × ·52 38·3	12 × 3½ × ·62 41·1	12 × 3½ × 3½ × ·56 45·4	12 × 4 × 4 × ·52 47·6
43	34½	Frames	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·52	8½ × 3½ × ·52
		Reversed frames ..	5½ × 3½ × ·50	6 × 3½ × ·50	6½ × 3½ × ·50	7 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52
		Depth of framing ..	10½	11	11½	12	12½	13
		Bulb angle or channel frames	11½ × 3½ × ·56 36·3	12 × 3½ × ·52 38·3	12 × 3½ × ·62 41·1	12 × 3½ × 3½ × ·52 43·8	12 × 4 × 4 × ·52 47·6	12 × 4 × 4 × ·58 53·1
44	35	Frames	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·54	8½ × 3½ × ·54
		Reversed frames ..	6 × 3½ × ·50	6½ × 3½ × ·50	7 × 3½ × ·52	7½ × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·54
		Depth of framing ..	11	11½	11½	12	12½	13
		Bulb angle or channel frames	12 × 3½ × ·52 38·3	12 × 3½ × ·62 41·1	12 × 3½ × ·66 42·1	12 × 3½ × 3½ × ·56 45·4	12 × 4 × 4 × ·56 49·3	13 × 4 × 4 × ·50 52·6
45	35½	Frames	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·54
		Reversed frames ..	6½ × 3½ × ·50	7 × 3½ × ·50	7½ × 3½ × ·52	8 × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·54
		Depth of framing ..	11½	12	12	12½	13	13½
		Bulb angle or channel frames	12 × 3½ × ·62 41·1	12 × 3½ × 3½ × ·52 43·8	12 × 3½ × 3½ × ·56 45·4	12 × 4 × 4 × ·52 47·6	13 × 4 × 4 × ·50 52·6	13 × 4 × 4 × ·54 54·5
46	36	Frames	8 × 3½ × ·50	8 × 3½ × ·50	8 × 3½ × ·52	8½ × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·58
		Reversed frames ..	7 × 3½ × ·50	7½ × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·58
		Depth of framing ..	12	12½	12½	13	13½	13½
		Channel frames ..	12 × 3½ × 3½ × ·52 43·8	12 × 3½ × 3½ × ·58 46·2	12 × 4 × 4 × ·52 47·6	12 × 4 × 4 × ·58 50·1	13 × 4 × 4 × ·54 54·5	13 × 4 × 4 × ·62 58·5

SIDE FRAMING.

FULL SCANTLING VESSELS—FLUSH DECK.

TABLE 3 (CONCLUDED.)

D	Frame Spacing.	Type of Framing.	Depth (d) at middle of length from top of floors at centre in way of single bottoms, and from top of margin plate in way of double bottoms, to lowest deck at side.					
			Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25	Feet. 26
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
40	33	Frames	8 × 3½ × ·52	8½ × 3½ × ·52	8½ × 3½ × ·54	9 × 4 × ·54	9½ × 4 × ·52	9½ × 4 × ·56
		Reversed frames	8 × 3½ × ·52	8 × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·54	8½ × 4 × ·52	8½ × 4 × ·56
		Depth of framing	12½	13	13½	14	14½	14½
		Channel frames	12 × 4 × 4 × ·52 47.6	12 × 4 × 4 × ·58 50.1	13 × 4 × 4 × ·54 54.5	13 × 4 × 4 × ·62 58.5	14 × 4 × 4 × ·58 63.0	15 × 4 × 4 × ·54 67.2
41	33½	Frames	8½ × 3½ × ·54	8½ × 3½ × ·52	8½ × 3½ × ·56	9 × 4 × ·58	9½ × 4 × ·54	9½ × 4 × ·60
		Reversed frames	7½ × 3½ × ·54	8½ × 3½ × ·52	8½ × 3½ × ·56	8½ × 3½ × ·58	8½ × 4 × ·54	8½ × 4 × ·60
		Depth of framing	12½	13½	13½	14	14½	14½
		Channel frames	12 × 4 × 4 × ·56 49.5	13 × 4 × 4 × ·52 53.6	13 × 4 × 4 × ·58 56.5	14 × 4 × 4 × ·56 61.9	15 × 4 × 4 × ·52 65.9	15 × 4 × 4 × ·58 69.4
42	34	Frames	8½ × 3½ × ·54	8½ × 3½ × ·54	9 × 4 × ·56	9 × 4 × ·60	9½ × 4 × ·58	9½ × 4 × ·62
		Reversed frames	8 × 3½ × ·54	8½ × 3½ × ·54	8½ × 3½ × ·56	8½ × 3½ × ·60	8½ × 4 × ·58	8½ × 4 × ·62
		Depth of framing	13	13½	14	14	14½	14½
		Channel frames	13 × 4 × 4 × ·50 52.6	13 × 4 × 4 × ·54 54.5	14 × 4 × 4 × ·52 59.7	14 × 4 × 4 × ·58 63.0	15 × 4 × 4 × ·56 68.4	15 × 4 × 4 × ·62 72.3
43	34½	Frames	8½ × 3½ × ·54	9 × 4 × ·54	9½ × 4 × ·52	9½ × 4 × ·56	9½ × 4 × ·60	9½ × 4 × ·66
		Reversed frames	8½ × 3½ × ·54	8½ × 3½ × ·54	8½ × 4 × ·52	8½ × 4 × ·56	8½ × 4 × ·60	8½ × 4 × ·66
		Depth of framing	13½	14	14½	14½	14½	14½
		Channel frames	13 × 4 × 4 × ·54 54.5	13 × 4 × 4 × ·62 58.5	14 × 4 × 4 × ·58 63.0	15 × 4 × 4 × ·54 67.2	15 × 4 × 4 × ·58 69.4	15 × 4 × 4 × ·66 74.8
44	35	Frames	8½ × 3½ × ·56	9 × 4 × ·56	9½ × 4 × ·54	9½ × 4 × ·58	9½ × 4 × ·64	
		Reversed frames	8½ × 3½ × ·56	8½ × 3½ × ·56	8½ × 4 × ·54	8½ × 4 × ·58	8½ × 4 × ·64	
		Depth of framing	13½	14	14½	14½	14½	
		Channel frames	13 × 4 × 4 × ·58 56.5	14 × 4 × 4 × ·52 59.4	15 × 4 × 4 × ·52 65.9	15 × 4 × 4 × ·56 68.4	15 × 4 × 4 × ·64 73.6	
45	35½	Frames	9 × 4 × ·56	9½ × 4 × ·52	9½ × 4 × ·56	9½ × 4 × ·62		
		Reversed frames	8½ × 3½ × ·56	8½ × 4 × ·52	8½ × 4 × ·56	8½ × 4 × ·62		
		Depth of framing	14	14½	14½	14½		
		Channel frames	14 × 4 × 4 × ·52 59.4	14 × 4 × 4 × ·58 63.0	15 × 4 × 4 × ·54 64.2	15 × 4 × 4 × ·62 72.3		
46	36	Frames	9 × 4 × ·58	9½ × 4 × ·54	9½ × 4 × ·60			
		Reversed frames	8½ × 3½ × ·58	8½ × 4 × ·54	8½ × 4 × ·60			
		Depth of framing	14	14½	14½			
		Channel frames	14 × 4 × 4 × ·56 61.9	15 × 4 × 4 × ·52 65.9	15 × 4 × 4 × ·58 69.4			

SIDE FRAMING. Standard Hughes TABLE 3A

FULL SCANTLING VESSELS WITH 100 PER CENT. SUPERSTRUCTURES. (SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.						
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14	Feet. 15	Feet. 16
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
26	26	Frames..	5 × 3 × ·36	5 × 3½ × ·36	5 × 3½ × ·36	5 × 3½ × ·38	5 × 3½ × ·38	5 × 3½ × ·38	5 × 3½ × ·38	5½ × 3½ × ·38
		Reversed frames ..	3 × 3 × ·36	3 × 3½ × ·36	3½ × 3½ × ·36	4 × 3½ × ·38	4½ × 3½ × ·38	4½ × 3½ × ·38	5 × 3½ × ·38	5 × 3½ × ·38
		Depth of framing ..	5½	5½	6	6	6½	6½	7	7½
		Bulb angle frames..	7 × 3 × ·40 10 6	7½ × 3½ × ·36 11 8	7½ × 3½ × ·46 13·15	8 × 3½ × ·38 13 85	8 × 3½ × ·46 15 05	8 × 3½ × ·46 15·05	8½ × 3½ × ·42 16 5	8½ × 3½ × ·52 19 2
27	26½	Frames..	5 × 3 × ·38	5 × 3½ × ·36	5 × 3½ × ·38	5 × 3½ × ·40	5 × 3½ × ·38	5 × 3½ × ·38	5 × 3½ × ·40	5½ × 3½ × ·40
		Reversed frames ..	3½ × 3 × ·38	3½ × 3½ × ·36	4 × 3½ × ·38	4 × 3½ × ·40	4½ × 3½ × ·38	5 × 3½ × ·38	5 × 3½ × ·40	5 × 3½ × ·40
		Depth of framing ..	5½	6	6	6	6½	7	7	7½
		Bulb angle frames..	7 × 3 × ·44 11·0	7½ × 3½ × ·46 13 15	8 × 3½ × ·38 13 85	8 × 3½ × ·42 14·45	8 × 3½ × ·46 15 05	8½ × 3½ × ·42 16 5	8½ × 3½ × ·48 17 52	9 × 3½ × ·44 19 2
28	27	Frames..	5½ × 3½ × ·36	5½ × 3½ × ·38	5½ × 3½ × ·38	5½ × 3½ × ·38	5½ × 3½ × ·38	5½ × 3½ × ·40	5½ × 3½ × ·40	5½ × 3½ × ·40
		Reversed frames ..	3 × 3 × ·36	3½ × 3½ × ·38	4 × 3½ × ·38	4 × 3½ × ·38	4½ × 3½ × ·38	4½ × 3½ × ·40	5 × 3½ × ·40	5½ × 3½ × ·40
		Depth of framing ..	6	6	6½	6½	7	7	7½	8
		Bulb angle frames..	7½ × 3½ × ·36 11 8	8 × 3½ × ·38 13 85	8 × 3½ × ·46 15 05	8 × 3½ × ·46 15 05	8½ × 3½ × ·42 16 5	8½ × 3½ × ·48 17·52	9 × 3½ × ·44 19 2	9½ × 3½ × ·42 20 85
29	27½	Frames..	5½ × 3½ × ·38	5½ × 3½ × ·40	5½ × 3½ × ·38	5½ × 3½ × ·38	5½ × 3½ × ·40	6 × 3½ × ·38	6 × 3½ × ·38	6 × 3½ × ·38
		Reversed frames ..	3½ × 3 × ·38	3½ × 3½ × ·40	4 × 3½ × ·38	4½ × 3½ × ·38	4½ × 3½ × ·40	4½ × 3½ × ·38	5 × 3½ × ·38	5½ × 3½ × ·38
		Depth of framing ..	6	6	6½	7	7	7½	8	8½
		Bulb angle frames..	7½ × 3½ × ·40 12 3	8 × 3½ × ·42 14·45	8 × 3½ × ·46 15·05	8½ × 3½ × ·42 16 5	8½ × 3½ × ·48 17. 52	8½ × 3½ × ·52 18·2	9 × 3½ × ·48 19 85	9½ × 3½ × ·44 21 35
30	28	Frames..	5½ × 3½ × ·40	5½ × 3½ × ·40	5½ × 3½ × ·38	5½ × 3½ × ·40	6 × 3½ × ·38	6 × 3½ × ·38	6 × 3½ × ·40	9 × 3½ × ·40
		Reversed frames ..	3½ × 3 × ·40	4 × 3½ × ·40	4½ × 3½ × ·38	4½ × 3½ × ·40	4½ × 3½ × ·38	5 × 3½ × ·38	5 × 3½ × ·40	5½ × 3½ × ·40
		Depth of framing ..	6	6½	7	7	7½	8	8	8½
		Bulb angle frames..	7½ × 3½ × ·44 12 9	8 × 3½ × ·50 15 4	8½ × 3½ × ·42 16 5	8½ × 3½ × ·48 17. 52	8½ × 3½ × ·52 18·2	9 × 3½ × ·48 19 85	9½ × 3½ × ·42 20 85	9½ × 3½ × ·48 22 3
31	28½	Frames..	6 × 3½ × ·40	6 × 3½ × ·38	6 × 3½ × ·40	6 × 3½ × ·38	6 × 3½ × ·40	6 × 3½ × ·40	6 × 3½ × ·40	6 × 3½ × ·38
		Reversed frames ..	3½ × 3 × ·40	4 × 3½ × ·38	4 × 3½ × ·40	4½ × 3½ × ·38	4½ × 3½ × ·40	5 × 3½ × ·40	5½ × 3½ × ·40	6 × 3½ × ·38
		Depth of framing ..	6½	7	7	7½	7½	8	8½	9
		Bulb angle frames..	8 × 3½ × ·40 14· 15	8½ × 3½ × ·42 16·5	8½ × 3½ × ·48 17 52	8½ × 3½ × ·52 18·2	9 × 3½ × ·44 19·2	9½ × 3½ × ·42 20·85	9½ × 3½ × ·48 22 3.	9½ × 3½ × ·52 23·2
32	29	Frames..	6 × 3½ × ·42	6 × 3½ × ·38	6 × 3½ × ·40	6 × 3½ × ·42	6 × 3½ × ·40	6 × 3½ × ·42	6½ × 3½ × ·38	6½ × 3½ × ·38
		Reversed frames ..	3½ × 3 × ·42	4½ × 3½ × ·38	4½ × 3½ × ·40	4½ × 3½ × ·42	5 × 3½ × ·40	5 × 3½ × ·42	5½ × 3½ × ·38	6 × 3½ × ·38
		Depth of framing ..	6½	7½	7½	7½	8	8	9	9½
		Bulb angle frames..	8 × 3½ × ·44 14 75	8½ × 3½ × ·52 18·2	9 × 3½ × ·44 19·2	9 × 3½ × ·48 19 85	9½ × 3½ × ·42 20 85	9½ × 3½ × ·46 21 85	9½ × 3½ × ·52 23·2.	10 × 3½ × ·48 24·85

SIDE FRAMING. Standard Height TABLE 3A

FULL SCANTLING VESSELS WITH 100 PER CENT. SUPERSTRUCTURES. (SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.							
			Feet. 17	Feet. 18	Feet. 19	Feet. 20	Feet. 21	Feet. 22	Feet. 23	Feet. 24
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
26	26	Frames	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$6\times3\frac{1}{2}\times\cdot38$						
		Reversed frames..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot38$						
		Depth of framing	8	$8\frac{1}{2}$						
		Bulb angle frames	$9\times3\frac{1}{2}\times\cdot48$ 19.85	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot44$ 21.35						
27	$26\frac{1}{2}$	Frames	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$6\times3\frac{1}{2}\times\cdot40$	$6\times3\frac{1}{2}\times\cdot42$					
		Reversed frames..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$6\times3\frac{1}{2}\times\cdot42$					
		Depth of framing	8	$8\frac{1}{2}$	9					
		Bulb angle frames	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot42$ 20.85	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 22.3	$10\times3\frac{1}{2}\times\cdot50$ 25.35					
28	27	Frames	$6\times3\frac{1}{2}\times\cdot40$	$6\times3\frac{1}{2}\times\cdot40$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot40$				
		Reversed frames	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$6\times3\frac{1}{2}\times\cdot40$	$6\times3\frac{1}{2}\times\cdot40$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot40$				
		Depth of framing	$8\frac{1}{2}$	9	$9\frac{1}{2}$	10				
		Bulb angle frames	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 22.3	$10\times3\frac{1}{2}\times\cdot46$ 24.35	$10\times3\frac{1}{2}\times\cdot54$ 26.3	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 28.0				
29	$27\frac{1}{2}$	Frames	$6\times3\frac{1}{2}\times\cdot38$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot44$			
		Reversed frames..	$6\times3\frac{1}{2}\times\cdot38$	$6\times3\frac{1}{2}\times\cdot38$	$6\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$			
		Depth of framing	9	$9\frac{1}{2}$	$9\frac{1}{2}$	10	$10\frac{1}{2}$			
		Bulb angle frames	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 23.2	$10\times3\frac{1}{2}\times\cdot48$ 24.85	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 24.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 30.5	$11\times3\frac{1}{2}\times\cdot54$ 32.4			
30	28	Frames	$6\times3\frac{1}{2}\times\cdot40$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$7\times3\frac{1}{2}\times\cdot42$	$7\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot46$		
		Reversed frames..	$6\times3\frac{1}{2}\times\cdot40$	$6\times3\frac{1}{2}\times\cdot40$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot46$		
		Depth of framing	9	$9\frac{1}{2}$	10	$10\frac{1}{2}$	$10\frac{1}{2}$	11		
		Bulb angle frames	$10\times3\frac{1}{2}\times\cdot46$ 24.35	$10\times3\frac{1}{2}\times\cdot54$ 26.3	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 29.0	$11\times3\frac{1}{2}\times\cdot50$ 31.4	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 34.1	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 35.8		
31	$28\frac{1}{2}$	Frames	$6\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot46$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	
		Reversed frames..	$6\times3\frac{1}{2}\times\cdot42$	$6\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot46$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	
		Depth of framing	9	$9\frac{1}{2}$	10	$10\frac{1}{2}$	11	$11\frac{1}{2}$	12	
		Bulb angle frames	$10\times3\frac{1}{2}\times\cdot50$ 25.25	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 24.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 30.5	$11\times3\frac{1}{2}\times\cdot54$ 32.4	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 35.8	$12\times3\frac{1}{2}\times\cdot52$ 38.3	$12\times3\frac{1}{2}\times\cdot66$ 42.1	
32	29	Frames	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$7\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot44$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot48$
		Reversed frames..	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot44$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot48$
		Depth of framing	10	10	$10\frac{1}{2}$	11	$11\frac{1}{2}$	12	$12\frac{1}{2}$	13
		Bulb angle or channel frames	$10\times3\frac{1}{2}\times\cdot56$ 26.75	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 24.0	$11\times3\frac{1}{2}\times\cdot54$ 32.4	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 34.7	$12\times3\frac{1}{2}\times\cdot48$ 34.1	$12\times3\frac{1}{2}\times\cdot60$ 40.6	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 43.0	$12\times4\times4\times\cdot50$ 46 8

SIDE FRAMING.

FULL SCANTLING VESSELS WITH 100 PER CENT. SUPERSTRUCTURES.

TABLE 3A

(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.					
			Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25	Feet. 26
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
33	29½	Frames	7½ × 3½ × ·46	7½ × 3½ × ·48	8 × 3½ × ·46	8 × 3½ × ·50		
		Reversed frames	7 × 3½ × ·46	7½ × 3½ × ·48	8 × 3½ × ·46	8 × 3½ × ·50		
		Depth of framing	11½	12	13	13		
		Bulb angle or channel frames	12 × 3½ × ·52 38.3.	12 × 3½ × ·66 42.1.	12 × 3½ × 3½ × ·56	12 × 4 × 4 × ·54		
34	30	Frames	7½ × 3½ × ·46	8 × 3½ × ·48	8 × 3½ × ·48	8½ × 3½ × ·52	9 × 4 × ·54	
		Reversed frames	7½ × 3½ × ·46	7½ × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·52	8 × 3½ × ·54	
		Depth of framing	12	12½	13	13	13½	
		Bulb angle or channel frames	12 × 3½ × ·60 40.6	12 × 3½ × 3½ × ·54 44.6	12 × 4 × 4 × ·50 46.8	12 × 4 × 4 × ·58 50.1.	13 × 4 × 4 × ·54 54.5	
35	30½	Frames	8 × 3½ × ·48	8 × 3½ × ·50	8½ × 3½ × ·52	9 × 4 × ·52	9 × 4 × ·56	9 × 4 × ·56
		Reversed frames	7 × 3½ × ·48	7½ × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·56	8½ × 3½ × ·56
		Depth of framing	12	12½	13	13½	13½	14
		Bulb angle or channel frames	12 × 3½ × ·66 42.1.	12 × 3½ × 3½ × ·58 46.20	12 × 4 × 4 × ·58 50.7	13 × 4 × 4 × ·52 53.6	13 × 4 × 4 × ·58 56.6	14 × 4 × 4 × ·52 59.4
36	31	Frames	8 × 3½ × ·52	8 × 3½ × ·52	8½ × 3½ × ·54	9 × 4 × ·54	9 × 4 × ·56	9 × 4 × ·60
		Reversed frames	7½ × 3½ × ·52	8 × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·54	8½ × 3½ × ·56	8½ × 3½ × ·60
		Depth of framing	12	12½	13	13½	14	14
		Channel frames	12 × 3½ × 3½ × ·56	12 × 4 × 4 × ·52	13 × 4 × 4 × ·50	13 × 4 × 4 × ·54	14 × 4 × 4 × ·52	14 × 4 × 4 × ·58
37	31½	Frames	8 × 3½ × ·54	8½ × 3½ × ·52	8½ × 3½ × ·52	9 × 4 × ·56	9 × 4 × ·58	9½ × 4 × ·54
		Reversed frames	7½ × 3½ × ·54	8 × 3½ × ·52	8½ × 3½ × ·52	8 × 3½ × ·56	8½ × 3½ × ·58	8½ × 4 × ·54
		Depth of framing	12	13	13½	13½	14	14½
		Channel frames	12 × 3½ × 3½ × ·58	12 × 4 × 4 × ·58	13 × 4 × 4 × ·52	13 × 4 × 4 × ·58	14 × 4 × 4 × ·56	15 × 4 × 4 × ·52
38	32	Frames	8 × 3½ × ·54	8½ × 3½ × ·54	8½ × 3½ × ·56	9 × 4 × ·56	9½ × 4 × ·52	9½ × 4 × ·58
		Reversed frames	8 × 3½ × ·54	8 × 3½ × ·54	8½ × 3½ × ·56	8½ × 3½ × ·56	8½ × 4 × ·52	8½ × 4 × ·58
		Depth of framing	12½	13	13½	14	14½	14½
		Channel frames	12 × 4 × 4 × ·56	13 × 4 × 4 × ·50	13 × 4 × 4 × ·58	14 × 4 × 4 × ·52	14 × 4 × 4 × ·58	15 × 4 × 4 × ·56
39	32½	Frames	8½ × 3½ × ·52	8½ × 3½ × ·54	9 × 4 × ·54	9 × 4 × ·58	9½ × 4 × ·56	9½ × 4 × ·60
		Reversed frames	8 × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·54	8½ × 3½ × ·58	8½ × 4 × ·56	8½ × 4 × ·60
		Depth of framing	13	13½	14	14	14½	14½
		Channel frames	12 × 4 × 4 × ·58	13 × 4 × 4 × ·54	13 × 4 × 4 × ·62	14 × 4 × 4 × ·56	15 × 4 × 4 × ·54	15 × 4 × 4 × ·58

SIDE FRAMING.

FULL SCANTLING VESSELS WITH 100 PER CENT. SUPERSTRUCTURES.

TABLE 3A.

(SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.				
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
40	33	Frames	8 × 3½ × ·44	8 × 3½ × ·44	8 × 3½ × ·42	8 × 3½ × ·44	8 × 3½ × ·46	8 × 3½ × ·44
		Reversed frames ..	4 × 3½ × ·46	4½ × 3½ × ·44	5 × 3½ × ·42	5 × 3½ × ·44	5 × 3½ × ·46	5½ × 3½ × ·44
		Depth of framing ..	9	9½	10	10	10	10½
		Bulb angle frames ..	10½ × 3½ × ·48	10½ × 3½ × ·48	10½ × 3½ × ·52	10½ × 3½ × ·58	11 × 3½ × ·50	11 × 3½ × ·54
41	33½	Frames	8 × 3½ × ·44	8 × 3½ × ·44	8 × 3½ × ·42	8 × 3½ × ·44	8 × 3½ × ·46	8 × 3½ × ·44
		Reversed frames ..	4½ × 3½ × ·44	5 × 3½ × ·44	5½ × 3½ × ·42	5½ × 3½ × ·44	5½ × 3½ × ·46	6 × 3½ × ·44
		Depth of framing ..	9½	10	10½	10½	10½	11
		Bulb angle frames ..	10½ × 3½ × ·50	10½ × 3½ × ·58	11 × 3½ × ·50	11 × 3½ × ·54	11½ × 3½ × ·48	11½ × 3½ × ·50
42	34	Frames	8 × 3½ × ·46	8 × 3½ × ·44	8 × 3½ × ·46	8 × 3½ × ·44	8 × 3½ × ·46	8 × 3½ × ·44
		Reversed frames ..	4½ × 3½ × ·46	5½ × 3½ × ·44	5½ × 3½ × ·46	6 × 3½ × ·44	6 × 3½ × ·46	6½ × 3½ × ·44
		Depth of framing ..	9½	10½	10½	11	11	11½
		Bulb angle frames ..	10½ × 3½ × ·54	11 × 3½ × ·54	11½ × 3½ × ·48	11½ × 3½ × ·50	11½ × 3½ × ·54	12 × 3½ × ·48
43	34½	Frames	8 × 3½ × ·46	8 × 3½ × ·44	8 × 3½ × ·46	8 × 3½ × ·44	8 × 3½ × ·46	8 × 3½ × ·44
		Reversed frames ..	5 × 3½ × ·46	6 × 3½ × ·44	6 × 3½ × ·46	6½ × 3½ × ·44	6½ × 3½ × ·46	7 × 3½ × ·44
		Depth of framing ..	10	11	11	11½	11½	12
		Bulb angle frames ..	11 × 3½ × ·50	11½ × 3½ × ·50	11½ × 3½ × ·54	12 × 3½ × ·48	12 × 3½ × ·52	12 × 3½ × ·56
44	35	Frames	8 × 3½ × ·46	8 × 3½ × ·46	8 × 3½ × ·48	8 × 3½ × ·46	8 × 3½ × ·48	8 × 3½ × ·46
		Reversed frames ..	5½ × 3½ × ·46	6 × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·46	6½ × 3½ × ·48	7 × 3½ × ·46
		Depth of framing ..	10½	11	11	11½	11½	12
		Bulb angle frames ..	11½ × 3½ × ·48	11½ × 3½ × ·54	12 × 3½ × ·48	12 × 3½ × ·52	12 × 3½ × ·56	12 × 3½ × ·60
45	35½	Frames	8 × 3½ × ·48	8 × 3½ × ·46	8 × 3½ × ·48	8 × 3½ × ·46	8 × 3½ × ·48	8 × 3½ × ·46
		Reversed frames ..	5½ × 3½ × ·48	6½ × 3½ × ·46	6½ × 3½ × ·48	7 × 3½ × ·46	7 × 3½ × ·48	7½ × 3½ × ·46
		Depth of framing ..	10½	11½	11½	12	12	12½
		Bulb angle or channel frames ..	11½ × 3½ × ·50	12 × 3½ × ·52	12 × 3½ × ·56	12 × 3½ × ·60	12 × 3½ × ·66	12 × 3½ × 3½ × ·50
46	36	Frames	8 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·48	8 × 3½ × ·50	8 × 3½ × ·48	8 × 3½ × ·50
		Reversed frames ..	6 × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·50	7½ × 3½ × ·48	7½ × 3½ × ·50
		Depth of framing ..	11	11½	12	12	12½	12½
		Bulb angle or channel frames ..	11½ × 3½ × ·60	12 × 3½ × ·56	12 × 3½ × ·66	12 × 3½ × 3½ × ·52	12 × 3½ × 3½ × ·54	12 × 3½ × 3½ × ·58

SIDE FRAMING. Standard Hughes TABLE 3A

FULL SCANTLING VESSELS WITH 100 PER CENT. SUPERSTRUCTURES. (SEE CONTINUATION.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.					
			Feet. 15	Feet. 16	Feet. 17	Feet. 18	Feet. 19	Feet. 20
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
40	33	Frames	8 ×3½×·44	8 ×3½×·44	8 ×3½×·48	8 ×3½×·48	8 ×3½×·50	8 ×3½×·54
		Reversed frames ..	6 ×3½×·44	6½×3½×·44	6½×3½×·48	7 ×3½×·48	7½×3½×·50	8 ×3½×·54
		Depth of framing ..	11	11½	11½	12	12½	12½
		Bulb angle or channel frames	11½×3½×·50 34.4	12 ×3½×·48 34.	12 ×3½×·56 39.5	12 ×3½×·66 42.1	12×3½×3½×·58 46.2	12×4 ×4 ×·56 49.3
41	33½	Frames	8 ×3½×·44	8 ×3½×·44	8 ×3½×·48	8 ×3½×·48	8 ×3½×·52	8½×3½×·54
		Reversed frames ..	6½×3½×·44	7 ×3½×·44	7 ×3½×·48	7½×3½×·48	8 ×3½×·52	8 ×3½×·54
		Depth of framing ..	11½	12	12	12½	12½	13
		Bulb angle or channel frames	12 ×3½×·48 37.1	12 ×3½×·56 39.5	12 ×3½×·66 42.1	12×3½×3½×·54 44.6	12×4 ×4 ×·52 47.6	13×4 ×4 ×·50 52.6
42	34	Frames	8 ×3½×·44	8 ×3½×·46	8 ×3½×·50	8 ×3½×·50	8½×3½×·52	9 ×4 ×·52
		Reversed frames ..	7 ×3½×·44	7×3½×·46	7 ×3½×·50	7½×3½×·50	8 ×3½×·52	8 ×3½×·52
		Depth of framing ..	12	12	12	12½	13	13½
		Bulb angle or channel frames	12 ×3½×·56 39.5	12 ×3½×·60 40.6	12×3½×3½×·52 43.8	12×3½×3½×·58 46.2	12× 4×4 ×·58 50.1	13×4 ×4 ×·52 53.6
43	34½	Frames	8 ×3½×·46	8 ×3½×·46	8 ×3½×·50	8 ×3½×·50	8½×3½×·52	9 ×4 ×·52
		Reversed frames ..	7 ×3½×·46	7½×3½×·46	7½×3½×·50	8 ×3½×·50	8½×3½×·52	8½×3½×·52
		Depth of framing ..	12	12½	12½	13	13½	14
		Bulb angle or channel frames	12 ×3½×·60 40.6	12×3½×3½×·50 43.0	12×3½×3½×·58 46.7	12×4 ×4 ×·54 48.5	13×4 ×4 ×·52 53.6	13×4 ×4 ×·58 56.5
44	35	Frames	8 ×3½×·48	8 ×3½×·48	8½×3½×·48	8½×3½×·50	9 ×4 ×·50	9 ×4 ×·54
		Reversed frames ..	7 ×3½×·48	7½×3½×·48	7½×3½×·48	8 ×3½×·50	8 ×3½×·50	8½×3½×·54
		Depth of framing ..	12	12½	13	13½	14	14
		Bulb angle or channel frames	12 ×3½×·66 42.4	12×3½×3½×·54 44.6	12×4 ×4 ×·50 46.8	13×4 ×4 ×·50 52.6	13×4 ×4 ×·54 54.5	13×4 ×4 ×·62 58.5
45	35½	Frames	8 ×3½×·48	8 ×3½×·48	8½×3½×·48	9 ×4 ×·52	9 ×4 ×·52	9 ×4 ×·56
		Reversed frames ..	7½×3½×·48	8 ×3½×·48	8 ×3½×·48	8 ×3½×·52	8½×4 ×·52	8½×3½×·56
		Depth of framing ..	12½	13	13½	13½	14	14
		Channel frames ..	12×3½×3½×·54 44.6	12×4 ×4 ×·50 46.8	12×4 ×4 ×·58 50.1	13×4 ×4 ×·52 53.6	13×4 ×4 ×·58 56.5	14×4 ×4 ×·52 59.4
46	36	Frames	8½×3½×·48	8½×3½×·48	9 ×4 ×·48 .	9 ×4 ×·52	9 ×4 ×·56	9½×4 ×·52
		Reversed frames ..	7½×3½×·48	8 ×3½×·48	8 ×3½×·48	8½×3½×·52	8½×4 ×·56	8½×4 ×·52
		Depth of framing ..	13	13½	14	14	14	14½
		Channel frames ..	12×4 ×4 ×·50 46.8	12×4 ×4 ×·58 50.1	13×4 ×4 ×·50 52.6	13×4 ×4 ×·58 56.5	14×4 ×4 ×·52 59.4	14×4 ×4 ×·58 63.0

SIDE FRAMING. Standard Height TABLE 3A

FULL SCANTLING VESSELS WITH 100 PER CENT. SUPERSTRUCTURES. (CONCLUDED.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.					
			Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25	Feet. 26
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
40	33	Frames	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot54$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot56$	$9\times4\times\cdot56$	$9\frac{1}{2}\times4\times\cdot52$	$9\frac{1}{2}\times4\times\cdot58$	$9\frac{1}{2}\times4\times\cdot62$
		Reversed frames ..	$8\times3\frac{1}{2}\times\cdot54$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot56$	$8\frac{1}{2}\times4\times\cdot56$	$8\frac{1}{2}\times4\times\cdot52$	$8\frac{1}{2}\times4\times\cdot58$	$8\frac{1}{2}\times4\times\cdot62$
		Depth of framing..	13	$13\frac{1}{2}$	14	$14\frac{1}{2}$	$14\frac{1}{2}$	$14\frac{1}{2}$
		Channel frames ..	$13\times4\times4\times\cdot50$ 52.6	$13\times4\times4\times\cdot58$ 56.5	$14\times4\times4\times\cdot52$ 59.4	$14\times4\times4\times\cdot58$ 63.0	$15\times4\times4\times\cdot56$ 61.4	$15\times4\times4\times\cdot62$ 72.3
41	$33\frac{1}{2}$	Frames	$9\times4\times\cdot54$	$9\times4\times\cdot54$	$9\frac{1}{2}\times4\times\cdot52$	$9\frac{1}{2}\times4\times\cdot56$	$9\frac{1}{2}\times4\times\cdot60$	$9\frac{1}{2}\times4\times\cdot66$
		Reversed frames ..	$8\times3\frac{1}{2}\times\cdot54$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot54$	$8\frac{1}{2}\times4\times\cdot52$	$8\frac{1}{2}\times4\times\cdot56$	$8\frac{1}{2}\times4\times\cdot60$	$8\frac{1}{2}\times4\times\cdot66$
		Depth of framing..	$13\frac{1}{2}$	14	$14\frac{1}{2}$	$14\frac{1}{2}$	$14\frac{1}{2}$	$14\frac{1}{2}$
		Channel frames ..	$13\times4\times4\times\cdot54$ 54.5	$13\times4\times4\times\cdot62$ 58.5	$14\times4\times4\times\cdot58$ 63.0	$15\times4\times4\times\cdot54$ 67.2	$15\times4\times4\times\cdot58$ 69.4	$15\times4\times4\times\cdot66$ 74.8
42	34	Frames	$9\times4\times\cdot54$	$9\times4\times\cdot58$	$9\frac{1}{2}\times4\times\cdot54$	$9\frac{1}{2}\times4\times\cdot58$	$9\frac{1}{2}\times4\times\cdot64$	
		Reversed frames ..	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot54$	$8\frac{1}{2}\times4\times\cdot58$	$8\frac{1}{2}\times4\times\cdot54$	$8\frac{1}{2}\times4\times\cdot58$	$8\frac{1}{2}\times4\times\cdot64$	
		Depth of framing..	14	14	$14\frac{1}{2}$	$14\frac{1}{2}$	$14\frac{1}{2}$	
		Channel frames ..	$13\times4\times4\times\cdot62$ 58.5	$14\times4\times4\times\cdot56$ 61.9	$15\times4\times4\times\cdot52$ 65.9	$15\times4\times4\times\cdot56$ 68.4	$15\times4\times4\times\cdot64$ 73.6	
43	$34\frac{1}{2}$	Frames	$9\times4\times\cdot56$	$9\frac{1}{2}\times4\times\cdot52$	$9\frac{1}{2}\times4\times\cdot56$	$9\frac{1}{2}\times4\times\cdot62$		
		Reversed frames ..	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot56$	$8\frac{1}{2}\times4\times\cdot52$	$8\frac{1}{2}\times4\times\cdot56$	$8\frac{1}{2}\times4\times\cdot62$		
		Depth of framing..	14	$14\frac{1}{2}$	$14\frac{1}{2}$	$14\frac{1}{2}$		
		Channel frames ..	$14\times4\times4\times\cdot52$ 59.4	$14\times4\times4\times\cdot58$ 63.0	$15\times4\times4\times\cdot54$ 67.2	$15\times4\times4\times\cdot62$ 72.3		
44	35	Frames	$9\times4\times\cdot58$	$9\frac{1}{2}\times4\times\cdot56$	$9\frac{1}{2}\times4\times\cdot60$	$9\frac{1}{2}\times4\times\cdot66$		
		Reversed frames ..	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot58$	$8\frac{1}{2}\times4\times\cdot56$	$8\frac{1}{2}\times4\times\cdot60$	$8\frac{1}{2}\times4\times\cdot66$		
		Depth of framing..	14	$14\frac{1}{2}$	$14\frac{1}{2}$	$14\frac{1}{2}$		
		Channel frames ..	$14\times4\times4\times\cdot56$ 61.9	$15\times4\times4\times\cdot54$ 67.2	$15\times4\times4\times\cdot58$ 69.4	$15\times4\times4\times\cdot66$ 74.8		
45	$35\frac{1}{2}$	Frames	$9\frac{1}{2}\times4\times\cdot52$	$9\frac{1}{2}\times4\times\cdot58$	$9\frac{1}{2}\times4\times\cdot62$			
		Reversed frames ..	$8\frac{1}{2}\times4\times\cdot52$	$8\frac{1}{2}\times4\times\cdot58$	$8\frac{1}{2}\times4\times\cdot62$			
		Depth of framing..	$14\frac{1}{2}$	$14\frac{1}{2}$	$14\frac{1}{2}$			
		Channel frames ..	$14\times4\times4\times\cdot58$ 63.0	$15\times4\times4\times\cdot56$ 69.4	$15\times4\times4\times\cdot62$ 72.3			
46	36	Frames	$9\frac{1}{2}\times4\times\cdot56$	$9\frac{1}{2}\times4\times\cdot62$				
		Reversed frames ..	$8\frac{1}{2}\times4\times\cdot56$	$8\frac{1}{2}\times4\times\cdot62$				
		Depth of framing..	$14\frac{1}{2}$	$14\frac{1}{2}$				
		Channel frames ..	$15\times4\times4\times\cdot54$ 67.2	$15\times4\times4\times\cdot62$ 72.3				

SIDE FRAMING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 4

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.						
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14	Feet. 15	Feet. 16
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
18	23	Frames	3 ×3 ×·26	3 ×3 ×·26	3 ×3 ×·28					
		Reversed frames ..	$2\frac{1}{2}$×$2\frac{1}{2}$×·26	$2\frac{1}{2}$×$2\frac{1}{2}$×·26	$2\frac{1}{2}$×$2\frac{1}{2}$×·28					
		Depth of framing ..	3	3	3					
		Angle frames	$5\frac{1}{2}$×3 ×·32 3·26	$5\frac{1}{2}$×3 ×·32 3·26	$5\frac{1}{2}$×3 ×·34 3·44					
19	$23\frac{1}{2}$	Frames	3 ×3 ×·26	3 ×3 ×·26	3 ×3 ×·28	3 ×3 ×·28				
		Reversed frames ..	3 ×$2\frac{1}{2}$×·26	3 ×$2\frac{1}{2}$×·26	3 ×$2\frac{1}{2}$×·28	3 ×3 ×·28				
		Depth of framing ..	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$				
		Angle frames	6 ×3 ×·32 3·89	6 ×3 ×·32 3·89	6 ×3 ×·34 4·09	$6\frac{1}{2}$×3 ×·34 4·42				
20	$23\frac{1}{2}$	Frames	3 ×3 ×·28	3 ×3 ×·28	3 ×3 ×·32	3 ×3 ×·30	$3\frac{1}{2}$×3 ×·30			
		Reversed frames ..	3 ×$2\frac{1}{2}$×·28	3 ×$2\frac{1}{2}$×·28	3 ×$2\frac{1}{2}$×·32	3 ×3 ×·30	3 ×3 ×·30			
		Depth of framing ..	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	4			
		Angle or bulb angle frames	6 ×3 ×·34 4·09	6 ×3 ×·34 4·09	$6\frac{1}{2}$×3 ×·32 4·44	$6\frac{1}{2}$×3 ×·38 5·25	$5\frac{1}{2}$×3 ×·34 5·95			
21	24	Frames	3 ×3 ×·28	3 ×3 ×·28	3 ×3 ×·32	$3\frac{1}{2}$×3 ×·30	$3\frac{1}{2}$×3 ×·30	$3\frac{1}{2}$×3 ×·32		
		Reversed frames ..	3 ×3 ×·28	3 ×3 ×·28	3 ×3 ×·32	3 ×3 ×·30	$3\frac{1}{2}$×3 ×·30	$3\frac{1}{2}$×3 ×·32		
		Depth of framing ..	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	4	$4\frac{1}{2}$	$4\frac{1}{2}$		
		Angle or bulb angle frames	$6\frac{1}{2}$×3 ×·34 4·42	$6\frac{1}{2}$×3 ×·34 4·42	$5\frac{1}{2}$×3 ×·28 5·50	$5\frac{1}{2}$×3 ×·34 5·95	6 ×3 ×·32 7·0	6 ×3 ×·38 7·5	6×3×44 8·0	6×3×40 9·0
22	24	Frames	3 ×3 ×·30	3 ×3 ×·32	3 ×3 ×·34	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·34	4 ×3 ×·34	
		Reversed frames ..	3 ×3 ×·30	3 ×3 ×·32	3 ×3 ×·34	3 ×3 ×·32	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·34	$3\frac{1}{2}$×3 ×·34	
		Depth of framing ..	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	4	$4\frac{1}{2}$	$4\frac{1}{2}$	5	
		Angle or bulb angle frames	$6\frac{1}{2}$×3 ×·38 5·25	$5\frac{1}{2}$×3 ×·28 5·50	$5\frac{1}{2}$×3 ×·32 5·80	$5\frac{1}{2}$×3 ×·40 6·40	6 ×3 ×·38 7·5	6 ×3 ×·42 7·6	$6\frac{1}{2}$×3 ×·38 8·75	7×3×32 9·65
23	$24\frac{1}{2}$	Frames	3 ×3 ×·32	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·34	4 ×3 ×·32	4 ×3 ×·32	4 ×3 ×·34	4 ×3 ×·34	$4\frac{1}{2}$×3 ×·34
		Reversed frames ..	3 ×3 ×·32	3 ×3 ×·32	3 ×3 ×·34	3 ×3 ×·32	$3\frac{1}{2}$×3 ×·32	$3\frac{1}{2}$×3 ×·34	4 ×3 ×·34	4 ×3 ×·34
		Depth of framing ..	$3\frac{1}{2}$	4	4	$4\frac{1}{2}$	5	5	$5\frac{1}{2}$	6
		Bulb angle frames	$5\frac{1}{2}$×3 ×·28 5·50	$5\frac{1}{2}$×3 ×·40 6·40	6 ×3 ×·30 6·60	6 ×3 ×·38 7·50	$6\frac{1}{2}$×3 ×·34 8·35	$6\frac{1}{2}$×3 ×·38 8·75	7 ×3 ×·36 10·10	7 ×3 ×·46 11·2
24	25	Frames	3 ×3 ×·32	$3\frac{1}{2}$×3 ×·34	$3\frac{1}{2}$×3 ×·36	4 ×3 ×·34	4 ×3 ×·34	4 ×3 ×·36	4 ×3 ×·36	$4\frac{1}{2}$×3 ×·36
		Reversed frames ..	3 ×3 ×·32	3 ×3 ×·34	3 ×3 ×·36	3 ×3 ×·34	$3\frac{1}{2}$×3 ×·34	$3\frac{1}{2}$×3 ×·36	4 ×3 ×·36	4 ×3 ×·36
		Depth of framing ..	$3\frac{1}{2}$	4	4	$4\frac{1}{2}$	5	5	$5\frac{1}{2}$	6
		Bulb angle frames	$5\frac{1}{2}$×3 ×·28 5·5	6 ×3 ×·30 6·8	6 ×3 ×·34 7·15	6 ×3 ×·42 7·8	$6\frac{1}{2}$×3 ×·38 8·75	$6\frac{1}{2}$×3 ×·44 9·35	7 ×3 ×·40 10·6	$7\frac{1}{2}$×3 ×·36 11·8
25	$25\frac{1}{2}$	Frames	3 ×3 ×·34	$3\frac{1}{2}$×3 ×·34	$3\frac{1}{2}$×3 ×·36	4 ×3 ×·34	4 ×3 ×·34	4 ×3 ×·36	$4\frac{1}{2}$×3 ×·36	$4\frac{1}{2}$×3 ×·40
		Reversed frames ..	3 ×3 ×·34	$3\frac{1}{2}$×3 ×·34	$3\frac{1}{2}$×3 ×·36	$3\frac{1}{2}$×3 ×·34	4 ×3 ×·34	4 ×3 ×·36	4 ×3 ×·36	$4\frac{1}{2}$×3 ×·40
		Depth of framing ..	$3\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	5	$5\frac{1}{2}$	$5\frac{1}{2}$	6	6
		Bulb angle frames	$5\frac{1}{2}$×3 ×·32 5·80	6 ×3 ×·42 7·8	$6\frac{1}{2}$×3 ×·32 8·16	$6\frac{1}{2}$×3 ×·38 8·75	7 ×3 ×·36 10·10	7 ×3 ×·40 10·6	$7\frac{1}{2}$×3 ×·36 11·8	$7\frac{1}{2}$×3 ×·44 12·8

SIDE FRAMING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 4

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.								
			Feet. 17	Feet. 18	Feet. 19	Feet. 20	Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
18	23	Frames									
		Reversed frames ..									
		Depth of framing ..									
		Angle frames									
19	$23\frac{1}{2}$	Frames									
		Reversed frames ..									
		Depth of framing ..									
		Angle frames									
20	$23\frac{1}{2}$	Frames									
		Reversed frames ..									
		Depth of framing ..									
		Angle or bulb angle frames									
21	24	Frames									
		Reversed frames ..									
		Depth of framing ..									
		Angle or bulb angle frames									
22	24	Frames									
		Reversed frames ..									
		Depth of framing ..									
		Bulb angle frames									
23	$24\frac{1}{2}$	Frames									
		Reversed frames ..									
		Depth of framing ..									
		Bulb angle frames									
24	25	Frames	$4\frac{1}{2} \times 3 \times .40$								
		Reversed frames ..	$4\frac{1}{2} \times 3 \times .40$								
		Depth of framing ..	6								
		Bulb angle frames	$7\frac{1}{2} \times 3 \times .44$ 12.8								
25	$25\frac{1}{2}$	Frames	$5 \times 3 \times .40$	$5 \times 3 \times .40$							
		Reversed frames ..	$4\frac{1}{2} \times 3 \times .40$	$5 \times 3 \times .40$							
		Depth of framing ..	$6\frac{1}{2}$	7							
		Bulb angle frames	$8 \times 3 \times .40$ 14.15"	$8 \times 3 \times .52$ 15.45"							

SIDE FRAMING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 4

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.						
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14	Feet. 15	Feet. 16
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
26	26	Frames	$3\frac{1}{2}\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot34$	$4\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot42$
		Reversed frames ..	$3\times3\times\cdot30$	$3\frac{1}{2}\times3\times\cdot36$	$3\frac{1}{2}\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot36$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot42$
		Depth of framing ..	4	$4\frac{1}{2}$	5	5	$5\frac{1}{2}$	$5\frac{1}{2}$	6	6
		Bulb angle frames	$5\frac{1}{2}\times3\times\cdot34$ 5·95	$6\frac{1}{2}\times3\times\cdot32$ 8·15	$6\frac{1}{2}\times3\times\cdot38$ 8·75	$6\frac{1}{2}\times3\times\cdot44$ 9·35	$7\times3\times\cdot40$ 10·6	$7\times3\times\cdot44$ 11·0 17·0	$7\frac{1}{2}\times3\times\cdot40$ 12·3	$8\times3\times\cdot38$ 13·85
27	$26\frac{1}{2}$	Frames	$3\frac{1}{2}\times3\times\cdot32$	$4\times3\times\cdot34$	$4\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot38$	$5\times3\times\cdot38$	$5\times3\times\cdot42$
		Reversed frames ..	$3\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot36$	$3\frac{1}{2}\times3\times\cdot34$	$4\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot42$
		Depth of framing ..	4	5	5	$5\frac{1}{2}$	6	6	$6\frac{1}{2}$	$6\frac{1}{2}$
		Bulb angle frames	$5\frac{1}{2}\times3\times\cdot40$ 6·4	$6\frac{1}{2}\times3\times\cdot38$ 8·75	$6\frac{1}{2}\times3\times\cdot44$ 9·35	$7\times3\times\cdot36$ 10·10	$7\frac{1}{2}\times3\times\cdot36$ 11·80	$7\frac{1}{2}\times3\times\cdot40$ 12·30	$8\times3\times\cdot38$ 13·85	$8\times3\times\cdot44$ 14·40
28	27	Frames	$3\frac{1}{2}\times3\times\cdot34$	$4\times3\times\cdot36$	$4\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot40$	$5\times3\times\cdot40$	$5\times3\times\cdot44$
		Reversed frames ..	$3\times3\times\cdot34$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot38$	$4\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot40$	$4\frac{1}{2}\times3\times\cdot40$	$4\frac{1}{2}\times3\times\cdot44$
		Depth of framing ..	4	5	5	$5\frac{1}{2}$	6	6	$6\frac{1}{2}$	$6\frac{1}{2}$
		Bulb angle frames	$6\times3\times\cdot30$ 6·8	$6\frac{1}{2}\times3\times\cdot44$ 9·35	$7\times3\times\cdot36$ 10·10	$7\times3\times\cdot44$ 11·0	$7\frac{1}{2}\times3\times\cdot40$ 12·30	$7\frac{1}{2}\times3\times\cdot44$ 12·8	$8\times3\times\cdot40$ 14·15	$8\frac{1}{2}\times3\times\cdot38$ 15·8
29	$27\frac{1}{2}$	Frames	$4\times3\times\cdot32$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot36$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$5\times3\frac{1}{2}\times\cdot38$	$5\times3\frac{1}{2}\times\cdot38$	$5\times3\frac{1}{2}\times\cdot38$	$5\times3\frac{1}{2}\times\cdot42$
		Reversed frames ..	$3\times3\times\cdot32$	$3\frac{1}{2}\times3\times\cdot36$	$4\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$5\times3\times\cdot38$	$5\times3\times\cdot42$
		Depth of framing ..	$4\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{1}{2}$	6	$6\frac{1}{2}$	$6\frac{1}{2}$	7	7
		Bulb angle frames	$6\times3\times\cdot38$ 7·5	$7\times3\frac{1}{2}\times\cdot40$ 10·6	$7\times3\frac{1}{2}\times\cdot44$ 11·05	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot40$ 12·3	$8\times3\frac{1}{2}\times\cdot38$ 13·85	$8\times3\frac{1}{2}\times\cdot38$ 13·85	$8\times3\frac{1}{2}\times\cdot46$ 15·05	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot42$ 16·5
30	28	Frames	$4\times3\times\cdot34$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$5\times3\frac{1}{2}\times\cdot38$	$5\times3\frac{1}{2}\times\cdot40$	$5\times3\frac{1}{2}\times\cdot40$	$5\times3\frac{1}{2}\times\cdot44$
		Reversed frames ..	$3\times3\times\cdot34$	$4\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot40$	$5\times3\times\cdot40$	$5\times3\times\cdot44$
		Depth of framing ..	$4\frac{1}{2}$	$5\frac{1}{2}$	6	6	$6\frac{1}{2}$	$6\frac{1}{2}$	7	7
		Bulb angle frames	$6\times3\times\cdot42$ 7·8	$7\times3\frac{1}{2}\times\cdot44$ 11·05	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot40$ 12·3	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot40$ 12·3	$8\times3\frac{1}{2}\times\cdot38$ 13·85	$8\times3\frac{1}{2}\times\cdot40$ 14·15	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot38$ 15·8	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 17·2
31	$28\frac{1}{2}$	Frames	$4\frac{1}{2}\times3\times\cdot34$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$5\times3\frac{1}{2}\times\cdot40$	$5\times3\frac{1}{2}\times\cdot40$	$5\times3\frac{1}{2}\times\cdot44$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$
		Reversed frames ..	$3\times3\times\cdot34$	$4\frac{1}{2}\times3\times\cdot38$	$4\frac{1}{2}\times3\times\cdot40$	$4\frac{1}{2}\times3\times\cdot42$	$4\frac{1}{2}\times3\times\cdot40$	$5\times3\times\cdot40$	$5\times3\times\cdot44$	$5\times3\times\cdot44$
		Depth of framing ..	5	6	6	6	$6\frac{1}{2}$	7	7	$7\frac{1}{2}$
		Bulb angle frames	$6\frac{1}{2}\times3\times\cdot38$ 8·75	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot40$ 12·4	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot44$ 12·9	$8\times3\frac{1}{2}\times\cdot38$ 13·85	$8\times3\frac{1}{2}\times\cdot40$ 14·15	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot38$ 15·8	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 17·2	$9\times3\frac{1}{2}\times\cdot42$ 18·85
32	29	Frames	$4\frac{1}{2}\times3\times\cdot36$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$4\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$5\times3\frac{1}{2}\times\cdot42$	$5\times3\frac{1}{2}\times\cdot42$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$
		Reversed frames ..	$3\times3\times\cdot36$	$4\frac{1}{2}\times3\times\cdot40$	$4\frac{1}{2}\times3\times\cdot42$	$4\frac{1}{2}\times3\times\cdot44$	$4\frac{1}{2}\times3\times\cdot42$	$5\times3\times\cdot42$	$5\times3\times\cdot42$	$5\times3\times\cdot46$
		Depth of framing ..	5	6	6	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$	$7\frac{1}{2}$
		Bulb angle frames	$6\frac{1}{2}\times3\times\cdot44$ 9·35	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot44$ 12·9	$8\times3\frac{1}{2}\times\cdot38$ 13·85	$8\times3\frac{1}{2}\times\cdot40$ 14·15	$8\times3\frac{1}{2}\times\cdot44$ 14·75	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot42$ 16·5	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 18·2	$9\times3\frac{1}{2}\times\cdot46$ 19·55

SIDE FRAMING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 4

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.								
			Feet. 17	Feet. 18	Feet. 19	Feet. 20	Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
26	26	Frames	5 × 3 × ·42	5 × 3 × ·42							
		Reversed frames ..	4½ × 3 × ·42	5 × 3 × ·42							
		Depth of framing ..	6½	7							
		Bulb angle frames	8 × 3 × ·44	8½ × 3 × ·42							
			14·7	16·45							
27	26½	Frames	5 × 3 × ·42	5½ × 3 × ·42	5½ × 3 × ·42						
		Reversed frames ..	5 × 3 × ·42	5 × 3 × ·42	5½ × 3 × ·42						
		Depth of framing ..	7	7½	8						
		Bulb angle frames	8½ × 3 × ·42	8½ × 3 × ·52	9 × 3 × ·46						
			16·45	18·0	19·55	21·1	22·65				
28	27	Frames	5 × 3 × ·44	5½ × 3 × ·44	5½ × 3 × ·46	6 × 3 × ·46					
		Reversed frames ..	5 × 3 × ·44	5 × 3 × ·44	5½ × 3 × ·46	5½ × 3 × ·46					
		Depth of framing ..	7	7½	8	8½					
		Bulb angle frames	8½ × 3 × ·46	9 × 3 × ·42	9½ × 3½ × ·44	9½ × 3½ × ·50					
			14·05	15·85	21·35	22·45	25·5				
29	27½	Frames	5½ × 3½ × ·42	5½ × 3½ × ·42	5½ × 3½ × ·48	6 × 3½ × ·44	6 × 3½ × ·44				
		Reversed frames ..	5 × 3 × ·42	5½ × 3 × ·42	5½ × 3 × ·48	5½ × 3½ × ·44	6 × 3½ × ·44				
		Depth of framing ..	7½	8	8	8½	9				
		Bulb angle frames	8½ × 3½ × ·52	9 × 3½ × ·46	9½ × 3½ × ·46	10 × 3½ × ·46	10½ × 3½ × ·44				
			18·2.	19·55	21·85	24·35	24·0.				
30	28	Frames	5½ × 3½ × ·44	5½ × 3½ × ·44	6 × 3½ × ·42	6 × 3½ × ·46	6 × 3½ × ·46	6½ × 3½ × ·46			
		Reversed frames ..	5 × 3 × ·44	5½ × 3 × ·44	5½ × 3½ × ·42	5½ × 3½ × ·46	6 × 3½ × ·46	6 × 3½ × ·46			
		Depth of framing ..	7½	8	8½	8½	9	9½			
		Bulb angle frames	9 × 3½ × ·42	9 × 3½ × ·50	9½ × 3½ × ·52	10 × 3½ × ·50	10½ × 3½ × ·48	10½ × 3½ × ·54			
			18·95	20·2.	22·2	25·35	28·0	29·5			
31	28½	Frames	5½ × 3½ × ·44	5½ × 3½ × ·44	6 × 3½ × ·44	6½ × 3½ × ·44	6½ × 3½ × ·46	6½ × 3½ × ·46	7 × 3½ × ·46		
		Reversed frames ..	5½ × 3 × ·44	5½ × 3½ × ·44	5½ × 3½ × ·44	5½ × 3½ × ·44	6 × 3½ × ·46	6½ × 3½ × ·46	6½ × 3½ × ·46		
		Depth of framing ..	8	8	8½	9	9½	10	10½		
		Bulb angle frames	9 × 3½ × ·50	9½ × 3½ × ·48	10 × 3½ × ·46	10 × 3½ × ·54	10½ × 3½ × ·54	11 × 3½ × ·50	11½ × 3½ × ·48		
			20·2	22·3.	24·35	26·3	29·5	31·4	34·1		
32	29	Frames	5½ × 3½ × ·46	5½ × 3½ × ·46	6 × 3½ × ·46	6½ × 3½ × ·46	6½ × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·48	
		Reversed frames ..	5½ × 3 × ·46	5½ × 3½ × ·46	5½ × 3½ × ·46	5½ × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·48	6½ × 3½ × ·48	7 × 3½ × ·48	
		Depth of framing ..	8	8	8½	9	9½	10	10½	11	
		Bulb angle frames	9½ × 3½ × ·44	9½ × 3½ × ·52	10 × 3½ × ·50	10½ × 3½ × ·46	11 × 3½ × ·46	11 × 3½ × ·56	11½ × 3½ × ·50	12 × 3½ × ·48	
			24·35	27·2	25·85	24·5	30·3.	32·9.	34·1	34·1	

SIDE FRAMING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 4

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.				
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
33	29½	Frames	5 ×3 ×·34	5 ×3½×·38	5 ×3½×·40	5 ×3½×·42	5 ×3½×·42	5½×3½×·40
		Reversed frames ..	3 ×3 ×·34	4½×3 ×·38	4½×3 ×·40	4½×3 ×·42	5 ×3 ×·42	5 ×3 ×·40
		Depth of framing..	5½	6½	6½	6½	7	7½
		Bulb angle frames..	7 ×3 ×·36 10·10	8 ×3½×·38 13·85	8 ×3½×·40 14·15	8 ×3½×·44 14·75	8½×3½×·42 16·50	8½×3½×·48 17·52
34	30	Frames	5 ×3 ×·36	5 ×3½×·38	5 ×3½×·38	5 ×3½×·40	5 ×3½×·44	5½×3½×·42
		Reversed frames ..	3 ×3 ×·36	5 ×3 ×·38	5 ×3 ×·38	5 ×3 ×·40	5 ×3 ×·44	5 ×3 ×·42
		Depth of framing..	5½	7	7	7	7	7½
		Bulb angle frames..	7 ×3 ×·40 10·6	8 ×3½×·46 15·05	8 ×3½×·46 15·05	8 ×3½×·52 16·0	8½×3½×·46 17·30	8½×3½×·52 18·20
35	30½	Frames	5 ×3 ×·38	5 ×3½×·38	5 ×3½×·40	5½×3½×·38	5½×3½×·38	5½×3½×·40
		Reversed frames ..	3½×3 ×·38	5 ×3 ×·38	5 ×3 ×·40	5 ×3 ×·38	5½×3 ×·38	5½×3 ×·40
		Depth of framing ..	5½	7	7	7½	8	8
		Bulb angle frames..	7 ×3 ×·44 11·0	8 ×3½×·46 15·05	8 ×3½×·52 16·0	8½×3½×·44 16·85	8½×3½×·52 18·2	9 ×3½×·42 18·85
36	31	Frames	5½×3½×·36	5 ×3½×·40	5½×3½×·38	5½×3½×·42	5½×3½×·40	5½×3½×·42
		Reversed frames ..	3 ×3 ×·36	5 ×3 ×·40	5 ×3 ×·38	5 ×3 ×·42	5½×3 ×·40	5½×3 ×·42
		Depth of framing ..	6	7	7½	7½	8	8
		Bulb angle frames..	7½×3½×·36 11·8	8 ×3½×·52 16·0	8½×3½×·44 16·85	8½×3½×·52 18·2	9 ×3½×·42 18·85	9 ×3½×·46 19·55
37	31½	Frames	5½×3½×·38	5½×3½×·40	5½×3½×·42	5½×3½×·44	5½×3½×·42	5½×3½×·40
		Reversed frames ..	3½× 3×·38	5 ×3 ×·40	5 ×3 ×·42	5 ×3 ×·44	5½×3 ×·42	5½×3½×·40
		Depth of framing..	6	7½	7½	7½	8	8
		Bulb angle frames..	7½×3½×·40 12·30	8½×3½×·48 17·52	8½×3½×·52 18·20	9 ×3½×·42 18·85	9 ×3½×·46 19·55	9½×3½×·42 20·85
38	32	Frames	5½×3½×·40	5½×3½×·42	6 ×3½×·40	6 ×3½×·42	6 ×3½×·40	6 ×3½×·40
		Reversed frames ..	3½×3 ×·40	5 ×3 ×·42	5 ×3 ×·40	5 ×3 ×·42	5 ×3½×·40	5½×3½×·40
		Depth of framing ..	6	7½	8	8	8	8½
		Bulb angle frames..	7½×3½×·44 12·90	8½×3½×·52 18·20	9 ×3½×·42 18·85	9 ×3½×·46 19·55	9½×3½×·42 20·85	9½×3½×·48 ~~23·30~~
39	32½	Frames	6 ×3½×·40	6 ×3½×·42	6 ×3½×·44	6 ×3½×·42	6 ×3½×·40	6 ×3½×·42
		Reversed frames ..	3½×3 ×·40	5 ×3 ×·42	5 ×3 ×·44	5½×3 ×·42	5½×3½×·40	5½×3½×·42
		Depth of framing ..	6½	8	8	8½	8½	8½
		Bulb angle frames..	8 ×3½×·40 14·15	9 ×3½×·46 19·55	9½×3½×·40 20·35	9½×3½×·44 21·35	9½×3½×·48 22·3	10 ×3½×·42 23·35

SIDE FRAMING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 4

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.					
			Feet. 15	Feet. 16	Feet. 17	Feet. 18	Feet. 19	Feet. 20
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
33	29½	Frames	5½ × 3½ × ·42	5½ × 3½ × ·44	5½ × 3½ × ·44	6 × 3½ × ·44	6 × 3½ × ·44	6½ × 3½ × ·46
		Reversed frames	5½ × 3 × ·42	5½ × 3 × ·44	5½ × 3½ × ·44	5½ × 3½ × ·44	6 × 3½ × ·44	6 × 3½ × ·46
		Depth of framing	8	8	8	8½	9	9½
		Bulb angle frames	9 × 3½ × ·46	9 × 3½ × ·50	9½ × 3½ × ·48	10 × 3½ × ·46	10 × 3½ × ·54	10½ × 3½ × ·54
			19.55	20 20	22.3.	24.35	26 30	29.5
34	30	Frames	5½ × 3½ × ·44	5½ × 3½ × ·42	6 × 3½ × ·42	6 × 3½ × ·46	6 × 3½ × ·46	6½ × 3½ × ·48
		Reversed frames	5½ × 3 × ·44	5½ × 3½ × ·42	5½ × 3½ × ·42	5½ × 3½ × ·46	6 × 3½ × ·46	6 × 3½ × ·48
		Depth of framing	8	8	8½	8½	9	9½
		Bulb angle frames	9 × 3½ × ·50	9½ × 3½ × ·46	9½ × 3½ × ·52	10 × 3½ × ·50	10½ × 3½ × ·46	11 × 3½ × ·46
			20 20	21.85	23.20	25.35	27.5	30.3
35	30½	Frames	5½ × 3½ × ·40	6 × 3½ × ·40	6 × 3½ × ·44	6½ × 3½ × ·44	6½ × 3½ × ·44	6½ × 3½ × ·46
		Reversed frames	5½ × 3½ × ·40	5½ × 3½ × ·40	5½ × 3½ × ·44	5½ × 3½ × ·44	6 × 3½ × ·44	6½ × 3½ × ·46
		Depth of framing	8	8½	8½	9	9½	10
		Bulb angle frames	9½ × 3½ × ·42	9½ × 3½ × ·48	10 × 3½ × ·46	10 × 3½ × ·54	10½ × 3½ × ·50	11 × 3½ × ·50
			20 85	22.30 ~~23.3.~~	24.35	26.30	28.5	31.4
36	31	Frames	5½ × 3½ × ·42	6 × 3½ × ·42	6 × 3½ × ·46	6½ × 3½ × ·46	6½ × 3½ × ·48	6½ × 3½ × ·48
		Reversed frames	5½ × 3½ × ·42	5½ × 3½ × ·42	5½ × 3½ × ·46	5½ × 3½ × ·46	6 × 3½ × ·48	6½ × 3½ × ·48
		Depth of framing	8	8½	8½	9	9½	10
		Bulb angle frames	9½ × 3½ × ·46	10 × 3½ × ·42	10 × 3½ × ·50	10½ × 3½ × ·46	11 × 3½ × ·46	11 × 3½ × ·56
			21.85	23.35	25.35	27.5	30.3	32.9
37	31½	Frames	6 × 3½ × ·40	6 × 3½ × ·44	6 × 3½ × ·44	6½ × 3½ × ·46	7 × 3½ × ·46	7 × 3½ × ·48
		Reversed frames	5½ × 3½ × ·40	5½ × 3½ × ·44	6 × 3½ × ·44	6 × 3½ × ·46	6 × 3½ × ·46	6½ × 3½ × ·48
		Depth of framing	8½	8½	9	9½	10	10½
		Bulb angle frames	9½ × 3½ × ·48	10 × 3½ × ·46	10 × 3½ × ·54	10½ × 3½ × ·54	11 × 3½ × ·50	11½ × 3½ × ·50
			22.30 ~~23.30~~	24.35	26.3	29.5	31.4	34.4
38	32	Frames	6 × 3½ × ·42	6 × 3½ × ·44	6 × 3½ × ·46	6½ × 3½ × ·48	7 × 3½ × ·48	7 × 3½ × ·50
		Reversed frames	5½ × 3½ × ·42	6 × 3½ × ·44	6 × 3½ × ·46	6 × 3½ × ·48	6 × 3½ × ·48	6½ × 3½ × ·50
		Depth of framing	8½	9	9	9½	10	10½
		Bulb angle frames	10 × 3½ × ·42	10 × 3½ × ·54	10½ × 3½ × ·46	11 × 3½ × ·46	11 × 3½ × ·56	11½ × 3½ × ·56
			23.35	26.3	27.5	~~30.9~~ 30.3	32.9	36 3.
39	32½	Frames	6 × 3½ × ·42	6 × 3½ × ·46	6½ × 3½ × ·46	7 × 3½ × ·46	7 × 3½ × ·48	7½ × 3½ × ·48
		Reversed frames	6 × 3½ × ·42	6 × 3½ × ·46	6 × 3½ × ·46	6 × 3½ × ·46	6½ × 3½ × ·48	6½ × 3½ × ·48
		Depth of framing	9	9	9½	10	10½	11
		Bulb angle frames	10 × 3½ × ·50	10½ × 3½ × ·46	10½ × 3½ × ·54	11 × 3½ × ·50	11½ × 3½ × ·50	12 × 3½ × ·48
			25.35	24.5	29.5	31.4	34.4	34.1.

SIDE FRAMING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 4

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.					
			Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25	Feet. 26
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
33	$29\frac{1}{2}$	Frames	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$		
		Reversed frames ..	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$		
		Depth of framing ..	10	$10\frac{1}{2}$	11	$11\frac{1}{2}$		
		Bulb angle frames..	$11\times3\frac{1}{2}\times\cdot50$ 31.4	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 34.7	$12\times3\frac{1}{2}\times\cdot48$ 34.1	$12\times3\frac{1}{2}\times\cdot56$ 39.5		
34	30	Frames	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot50$		
		Reversed frames ..	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot50$		
		Depth of framing ..	10	$10\frac{1}{2}$	11	$11\frac{1}{2}$		
		Bulb angle frames..	$11\times3\frac{1}{2}\times\cdot56$ 32.9	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 36.3	$12\times3\frac{1}{2}\times\cdot52$ 38.3	$12\times3\frac{1}{2}\times\cdot62$ 41.1		
35	$30\frac{1}{2}$	Frames	$7\times3\frac{1}{2}\times\cdot46$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot50$	
		Reversed frames ..	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot48$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	
		Depth of framing ..	$10\frac{1}{2}$	11	$11\frac{1}{2}$	12	$12\frac{1}{2}$	
		Bulb angle or channel frames	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 34.1	$12\times3\frac{1}{2}\times\cdot48$ 34.1	$12\times3\frac{1}{2}\times\cdot56$ 39.5	$12\times3\frac{1}{2}\times\cdot66$ 42.1	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 46.2	
36	31	Frames	$7\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot52$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$9\times4\times\cdot52$
		Reversed frames ..	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot52$
		Depth of framing ..	$10\frac{1}{2}$	$11\frac{1}{2}$	$11\frac{1}{2}$	12	13	$13\frac{1}{2}$
		Bulb angle or channel frames	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 36.3	$12\times3\frac{1}{2}\times\cdot56$ 39.5	$12\times3\frac{1}{2}\times\cdot62$ 41.1	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 45.4	$12\times4\times4\times\cdot54$ 48.5	$13\times4\times4\times\cdot52$ 53.6
37	$31\frac{1}{2}$	Frames	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot52$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$9\times4\times\cdot54$
		Reversed frames ..	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot52$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot54$
		Depth of framing ..	11	$11\frac{1}{2}$	12	$12\frac{1}{2}$	$13\frac{1}{2}$	$13\frac{1}{2}$
		Bulb angle or channel frames	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot60$ 34.3	$12\times3\frac{1}{2}\times\cdot62$ 41.1	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 43.8	$12\times4\times4\times\cdot52$ 47.6	$13\times4\times4\times\cdot50$ 52.6	$13\times4\times4\times\cdot54$ 54.5
38	32	Frames	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$8\times3\frac{1}{2}\times\cdot52$	$8\times3\frac{1}{2}\times\cdot54$	$9\times4\times\cdot52$	$9\times4\times\cdot54$
		Reversed frames ..	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$8\times3\frac{1}{2}\times\cdot54$	$8\times3\frac{1}{2}\times\cdot52$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot54$
		Depth of framing ..	11	$11\frac{1}{2}$	12	$12\frac{1}{2}$	$13\frac{1}{2}$	14
		Bulb angle or channel frames	$12\times3\frac{1}{2}\times\cdot52$ 38.3	$12\times3\frac{1}{2}\times\cdot66$ 42.1	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 45.4	$12\times4\times4\times\cdot56$ 49.3	$13\times4\times4\times\cdot52$ 53.6	$14\times4\times4\times\cdot50$ 58.6
39	$32\frac{1}{2}$	Frames	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot52$	$9\times4\times\cdot50$	$9\times4\times\cdot54$	$9\times4\times\cdot56$
		Reversed frames ..	$7\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot52$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot54$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot56$
		Depth of framing ..	$11\frac{1}{2}$	12	$12\frac{1}{2}$	$13\frac{1}{2}$	$13\frac{1}{2}$	14
		Bulb angle or channel frames	$12\times3\frac{1}{2}\times\cdot62$ 41.1	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 43.8	$12\times4\times4\times\cdot52$ 52.6	$13\times4\times4\times\cdot50$ 52.6	$13\times4\times4\times\cdot54$ 54.5	$14\times4\times4\times\cdot52$ 59.4

47.6

SIDE FRAMING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 4

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	FRAMING IN PEAKS.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.				
				Feet. 8	Feet. 10	Feet. 12	Feet. 13	Feet. 14
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
40	33	Frames	6 × 3½ × ·42	6½ × 3½ × ·40	6½ × 3½ × ·42	6½ × 3½ × ·44	6½ × 3½ × ·42	6½ × 3½ × ·44
		Reversed frames ..	3½ × 3 × ·42	5 × 3 × ·40	5 × 3 × ·42	5 × 3 × ·44	5 × 3½ × ·42	5 × 3½ × ·44
		Depth of framing ..	6½	8½	8½	8½	8½	8½
		Bulb angle frames..	8 × 3½ × ·44 14 7/8	9 × 3½ × ·52 20 55	9½ × 3½ × ·44 21. 35	9½ × 3½ × ·48 22. 3.	10 × 3½ × ·42 23. 35	10 × 3½ × ·46 24. 25
41	33½	Frames	6½ × 3½ × ·42	6½ × 3½ × ·44	6½ × 3½ × ·46	6½ × 3½ × ·48	6½ × 3½ × ·44	6½ × 3½ × ·46
		Reversed frames ..	3½ × 3 × ·42	5 × 3 × ·44	5 × 3 × ·46	5 × 3 × ·48	5 × 3½ × ·44	5 × 3½ × ·46
		Depth of framing ..	7	8½	8½	8½	8½	8½
		Bulb angle frames..	8½ × 3½ × ·42 16. 15	9½ × 3½ × ·48 22. 30	9½ × 3½ × ·50 22. 45	10 × 3½ × ·44 23. 85	10 × 3½ × ·46 24. 35	10 × 3½ × ·50 25. 35
42	34	Frames	7 × 3½ × ·42	7 × 3½ × ·42	7 × 3½ × ·44	7 × 3½ × ·46	7 × 3½ × ·48	7 × 3½ × ·46
		Reversed frames ..	3½ × 3 × ·42	4½ × 3½ × ·42	4½ × 3½ × ·44	4½ × 3½ × ·46	4½ × 3½ × ·48	5 × 3½ × ·46
		Depth of framing ..	7½	8½	8½	8½	8½	9
		Bulb angle frames..	8½ × 3½ × ·52 18. 2.	9½ × 3½ × ·52 23. 20	10 × 3½ × ·46 24. 35	10 × 3½ × ·50 25. 35	10 × 3½ × ·54 26. 3	10½ × 3½ × ·46 24. 5
43	34½	Frames	7½ × 3½ × ·42	7½ × 3½ × ·44	7½ × 3½ × ·42	7½ × 3½ × ·44	7½ × 3½ × ·46	7½ × 3½ × ·44
		Reversed frames ..	3½ × 3 × ·42	4 × 3½ × ·44	4½ × 3½ × ·42	4½ × 3½ × ·44	4½ × 3½ × ·46	5 × 3½ × ·44
		Depth of framing ..	8	8½	9	9	9	9½
		Bulb angle frames..	9 × 3½ × ·46 19. 5. 5	10 × 3½ × ·46 24. 35	10 × 3½ × ·50 23. 35	10 × 3½ × ·54 26. 30	10½ × 3½ × ·46 24. 5	10½ × 3½ × ·50 28. 5
44	35	Frames	7½ × 3½ × ·42	7½ × 3½ × ·44	7½ × 3½ × ·46	7½ × 3½ × ·48	7½ × 3½ × ·46	8 × 3½ × ·44
		Reversed frames ..	3½ × 3½ × ·42	4½ × 3½ × ·44	4½ × 3½ × ·46	4½ × 3½ × ·48	5 × 3½ × ·46	5 × 3½ × ·44
		Depth of framing ..	8	9	9	9	9½	10
		Bulb angle frames..	9½ × 3½ × ·46 21. 85	10 × 3½ × ·54 26. 30	10½ × 3½ × ·46 24. 5	10½ × 3½ × ·50 28 5	10½ × 3½ × ·54 29. 5	10½ × 3½ × ·58 30 5
45	35½	Frames	8 × 3½ × ·42	8 × 3½ × ·46	8 × 3½ × ·44	8 × 3½ × ·46	8 × 3½ × ·44	8 × 3½ × ·46
		Reversed frames ..	3½ × 3½ × ·42	4 × 3½ × ·46	4½ × 3½ × ·44	4½ × 3½ × ·46	5 × 3½ × ·44	5 × 3½ × ·46
		Depth of framing ..	8½	9	9½	9½	10	10
		Bulb angle frames..	9½ × 3½ × ·52 23. 20	10½ × 3½ × ·46 24. 5	10½ × 3½ × ·50 28 5	10½ × 3½ × ·54 29. 5	10½ × 3½ × ·58 30 5	11 × 3½ × ·50 31. 4
46	36	Frames	8 × 3½ × ·42	8 × 3½ × ·46	8 × 3½ × ·44	8 × 3½ × ·46	8 × 3½ × ·44	8 × 3½ × ·46
		Reversed frames ..	4 × 3½ × ·42	4½ × 3½ × ·46	5 × 3½ × ·44	5 × 3½ × ·46	5½ × 3½ × ·44	5½ × 3½ × ·46
		Depth of framing ..	9	9½	10	10	10½	10½
		Bulb angle frames..	10 × 3½ × ·50 23. 35	10½ × 3½ × ·54 29. 5	10½ × 3½ × ·58 30 5	11 × 3½ × ·50 31. 4	11 × 3½ × ·54 32. 4	11½ × 3½ × ·48 34. 1

SIDE FRAMING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 4

(See Continuation.)

D	FRAME SPACING.	TYPE OF FRAMING.	DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO LOWEST DECK AT SIDE.					
			Feet. 15	Feet. 16	Feet. 17	Feet. 18	Feet. 19	Feet. 20
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
40	33	Frames	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot52$
		Reversed frames ..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot44$	$6\times3\frac{1}{2}\times\cdot44$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot52$
		Depth of framing ..	9	$9\frac{1}{2}$	10	$10\frac{1}{2}$	$10\frac{1}{2}$	11
		Bulb angle frames..	$10\times3\frac{1}{2}\times\cdot54$ 26.30	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 28.50	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 30.5	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 34.1	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 36.3	$12\times3\frac{1}{2}\times\cdot56$ 39.5
41	$33\frac{1}{2}$	Frames	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot54$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot54$
		Reversed frames ..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot54$	$7\times3\frac{1}{2}\times\cdot54$
		Depth of framing ..	9	$9\frac{1}{2}$	10	$10\frac{1}{2}$	$10\frac{1}{2}$	11
		Bulb angle frames..	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 27.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 29.5	$11\times3\frac{1}{2}\times\cdot50$ 31.4	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 34.7	$12\times3\frac{1}{2}\times\cdot52$ 38.3	$12\times3\frac{1}{2}\times\cdot62$ 41.1
42	34	Frames	$7\times3\frac{1}{2}\times\cdot48$	$7\times3\frac{1}{2}\times\cdot44$	$7\times3\frac{1}{2}\times\cdot46$	$7\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$8\times3\frac{1}{2}\times\cdot52$
		Reversed frames ..	$5\times3\frac{1}{2}\times\cdot48$	$6\times3\frac{1}{2}\times\cdot44$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot52$	$7\times3\frac{1}{2}\times\cdot52$
		Depth of framing ..	9	10	$10\frac{1}{2}$	$10\frac{1}{2}$	11	$11\frac{1}{2}$
		Bulb angle frames..	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 28.5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 30.5	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 34.1	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 36.3	$12\times3\frac{1}{2}\times\cdot56$ 39.5	$12\times3\frac{1}{2}\times\cdot66$ 42.1
43	$34\frac{1}{2}$	Frames	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot52$
		Reversed frames ..	$5\times3\frac{1}{2}\times\cdot48$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$6\times3\frac{1}{2}\times\cdot50$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot52$
		Depth of framing ..	$9\frac{1}{2}$	10	$10\frac{1}{2}$	11	$11\frac{1}{2}$	12
		Bulb angle or channel frames	$11\times3\frac{1}{2}\times\cdot46$ 30.7	$11\times3\frac{1}{2}\times\cdot56$ 32.9	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 34.7	$12\times3\frac{1}{2}\times\cdot52$ 38.3	$12\times3\frac{1}{2}\times\cdot62$ 41.1	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 45.4
44	35	Frames	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot48$	$8\times3\frac{1}{2}\times\cdot52$	$8\times3\frac{1}{2}\times\cdot54$	$8\times3\frac{1}{2}\times\cdot54$
		Reversed frames ..	$5\times3\frac{1}{2}\times\cdot46$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot48$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$7\times3\frac{1}{2}\times\cdot54$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot54$
		Depth of framing ..	10	$10\frac{1}{2}$	11	11	$11\frac{1}{2}$	12
		Bulb angle or channel frames	$11\times3\frac{1}{2}\times\cdot50$ 31.4	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 34.1	$12\times3\frac{1}{2}\times\cdot48$ 34.1	$12\times3\frac{1}{2}\times\cdot56$ 39.5	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 43.8	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 46.2
45	$35\frac{1}{2}$	Frames	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot52$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot54$
		Reversed frames ..	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$5\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$6\times3\frac{1}{2}\times\cdot50$	$7\times3\frac{1}{2}\times\cdot52$	$7\times3\frac{1}{2}\times\cdot52$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot54$
		Depth of framing ..	$10\frac{1}{2}$	$10\frac{1}{2}$	11	$11\frac{1}{2}$	12	$12\frac{1}{2}$
		Bulb angle or channel frames	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$ 34.1	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 36.3	$12\times3\frac{1}{2}\times\cdot52$ 38.3	$12\times3\frac{1}{2}\times\cdot66$ 42.1	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 45.4	$12\times4\times4\times\cdot56$ 49.3
46	36	Frames	$8\times3\frac{1}{2}\times\cdot46$	$8\times3\frac{1}{2}\times\cdot50$	$8\times3\frac{1}{2}\times\cdot50$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$9\times4\times\cdot52$
		Reversed frames ..	$6\times3\frac{1}{2}\times\cdot46$	$6\times3\frac{1}{2}\times\cdot50$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$6\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$7\frac{1}{2}\times3\frac{1}{2}\times\cdot52$
		Depth of framing ..	11	11	$11\frac{1}{2}$	12	$12\frac{1}{2}$	13
		Bulb angle or channel frames	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 35.8	$12\times3\frac{1}{2}\times\cdot52$ 38.3	$12\times3\frac{1}{2}\times\cdot62$ 41.1	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 43.8	$12\times4\times4\times\cdot52$ 47.6	$12\times4\times4\times\cdot58$ 50.1

SIDE FRAMING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 4 *(Concluded.)*

D	Frame Spacing.	Type of Framing.	Depth (d) at middle of length from top of floors at centre in way of single bottoms, and from top of margin plate in way of double bottoms, to lowest deck at side.					
			Feet. 21	Feet. 22	Feet. 23	Feet. 24	Feet. 25	Feet. 26
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
40	33	Frames	8 × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·54	9 × 4 × ·52	9 × 4 × ·54	9 × 4 × ·58
		Reversed frames	7 × 3½ × ·52	7½ × 3½ × ·54	8 × 3½ × ·54	8 × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·58
		Depth of framing	11½	12	12½	13½	14	14
		Bulb angle or channel frames	12 × 3½ × ·66 42·1	12 × 3½ × 3½ × ·58	12 × 4 × 4 × ·56 49·3	13 × 4 × 4 × ·52 53·6	14 × 4 × 4 × ·50 58·6	14 × 4 × 4 × ·56 61·9
41	33½	Frames	8 × 3½ × ·52	8½ × 3½ × ·52	8½ × 3½ × ·54	9 × 4 × ·54	9 × 4 × ·56	9½ × 4 × ·52
		Reversed frames	7½ × 3½ × ·52	7½ × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·54	8½ × 3½ × ·56	8½ × 4 × ·52
		Depth of framing	12	12½	13	13½	14	14½
		Channel frames	12 × 3½ × 3½ × ·56 45·4	12 × 4 × 4 × ·52 47·6	13 × 4 × 4 × ·50 52·6	13 × 4 × 4 × ·54 54·5	14 × 4 × 4 × ·52 59·4	14 × 4 × 4 × ·58 63·0
42	34	Frames	8½ × 3½ × ·50	8½ × 3½ × ·52	9 × 4 × ·52	9 × 4 × ·54	9 × 4 × ·58	9½ × 4 × ·56
		Reversed frames	7 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·58	8½ × 4 × ·56
		Depth of framing	12½	13	13½	14	14	14½
		Channel frames	12 × 3½ × 3½ × ·58 46·2	12 × 4 × 4 × ·58 50·1	13 × 4 × 4 × ·52 53·6	14 × 4 × 4 × ·50 58·6	14 × 4 × 4 × ·56 61·9	15 × 4 × 4 × ·54 64·2
43	34½	Frames	8½ × 3½ × ·50	8½ × 3½ × ·54	9 × 4 × ·52	9 × 4 × ·56	9½ × 4 × ·54	9½ × 4 × ·58
		Reversed frames	7½ × 3½ × ·50	8 × 3½ × ·54	8½ × 3½ × ·52	8½ × 3½ × ·56	8½ × 4 × ·54	8½ × 4 × ·58
		Depth of framing	12½	13	14	14	14½	14½
		Channel frames	12 × 4 × 4 × ·50 46·8	13 × 4 × 4 × ·50 52·6	13 × 4 × 4 × ·58 56·5	14 × 4 × 4 × ·52 59·4	15 × 4 × 4 × ·52 65·9	15 × 4 × 4 × ·56 68·4
44	35	Frames	8½ × 3½ × ·52	8½ × 3½ × ·54	9 × 4 × ·54	9½ × 4 × ·52	9½ × 4 × ·56	9½ × 4 × ·60
		Reversed frames	8 × 3½ × ·52	8½ × 3½ × ·54	8½ × 3½ × ·54	8½ × 4 × ·52	8½ × 4 × ·56	8½ × 4 × ·60
		Depth of framing	13	13½	14	14½	14½	14½
		Channel frames	12 × 4 × 4 × ·58 50·1	13 × 4 × 4 × ·54 54·5	14 × 4 × 4 × ·50 58·6	14 × 4 × 4 × ·58 63·0	15 × 4 × 4 × ·54 64·2	15 × 4 × 4 × ·58 69·4
45	35½	Frames	8½ × 3½ × ·54	8½ × 3½ × ·56	9 × 4 × ·58	9½ × 4 × ·54	9½ × 4 × ·60	
		Reversed frames	8 × 3½ × ·54	8½ × 3½ × ·56	8½ × 3½ × ·58	8½ × 4 × ·54	8½ × 4 × ·60	
		Depth of framing	13	13½	14	14½	14½	
		Channel frames	13 × 4 × 4 × ·50 52·6	13 × 4 × 4 × ·58 56·5	14 × 4 × 4 × ·56 61·9	15 × 4 × 4 × ·52 65·9	15 × 4 × 4 × ·58 69·4	
46	36	Frames	9 × 4 × ·54	9 × 4 × ·54	9½ × 4 × ·52	9½ × 4 × ·56	9½ × 4 × ·62	
		Reversed frames	8 × 3½ × ·54	8½ × 3½ × ·54	8½ × 4 × ·52	8½ × 4 × ·56	8½ × 4 × ·62	
		Depth of framing	13½	14	14½	14½	14½	
		Channel frames	13 × 4 × 4 × ·54 54·5	14 × 4 × 4 × ·50 58·6	14 × 4 × 4 × ·58 63·0	15 × 4 × 4 × ·54 64·2	15 × 4 × 4 × ·62 72·3	

PANTING ARRANGEMENTS.

WEB FRAMES and STRINGERS.

TABLE 5

(See Continuation.)

DEPTH D	DEPTH (d) AT COLLISION BULKHEAD FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF BEAMS AT SIDE OF LOWEST DECK.						
	Feet. 12	Feet. 14	Feet. 16	Feet. 18	Feet. 20	Feet. 22	Feet. 24
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12	12 × ·30	12 × ·30					
14	12 × ·30	12 × ·30	13 × ·30				
16	12 × ·30	13 × ·30	13 × ·32	14 × ·32			
18	13 × ·30	13 × ·30	14 × ·30	15 × ·32	16 × ·34		
20	13 × ·30	13 × ·32	14 × ·32	15 × ·34	16 × ·36	18 × ·38	
22	13 × ·30	14 × ·32	14 × ·36	16 × ·36	17 × ·38	19 × ·40	21 × ·42
24	14 × ·30	15 × ·34	16 × ·36	17 × ·38	18 × ·40	20 × ·40	22 × ·44
26	14 × ·32	16 × ·36	17 × ·38	18 × ·40	20 × ·40	21 × ·42	24 × ·44
28	15 × ·34	17 × ·38	18 × ·40	20 × ·40	21 × ·42	23 × ·42	25 × ·46
30	16 × ·36	18 × ·38	20 × ·40	21 × ·42	22 × ·44	24 × ·44	26 × ·48
32	17 × ·38	19 × ·40	21 × ·42	22 × ·44	23 × ·44	25 × ·46	27 × ·48
34	18 × ·38	20 × ·40	22 × ·42	23 × ·46	24 × ·46	26 × ·48	28 × ·48
36	19 × ·40	21 × ·42	23 × ·44	25 × ·46	26 × ·46	28 × ·48	30 × ·50
38	21 × ·42	23 × ·44	26 × ·46	27 × ·48	28 × ·48	30 × ·50	32 × ·50
40	24 × ·44	26 × ·46	28 × ·48	29 × ·48	31 × ·50	33 × ·50	35 × ·52
42	26 × ·46	28 × ·48	30 × ·50	32 × ·50	33 × ·52	35 × ·52	37 × ·52
44	28 × ·48	30 × ·50	32 × ·50	34 × ·50	35 × ·52	37 × ·52	38 × ·54
46	30 × ·48	32 × ·50	34 × ·50	36 × ·52	37 × ·52	38 × ·52	40 × ·54
48	32 × ·50	34 × ·52	36 × ·52	38 × ·52	39 × ·54	41 × ·54	
50	34 × ·50	36 × ·52	38 × ·52	39 × ·52	40 × ·54	42 × ·54	

PANTING ARRANGEMENTS.

WEB FRAMES and STRINGERS.

TABLE 5 *(Concluded.)*

DEPTH D	DEPTH (d) AT COLLISION BULKHEAD FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF BEAMS AT SIDE OF LOWEST DECK.					Thickness of Stringer Plates.	FACE ANGLES.		BUTT STRAPS FOR STRINGER FACE ANGLES.				
									Dimensions.			Rivets.	
	Feet. 26	Feet. 28	Feet. 30	Feet. 32	Feet. 34		Double on Web Frames, Single on Stringers.	Single on Web Frames.	Length.	Breadth.	Thickness.	Number in Straps and Stringer Face Angles.	Number in Straps and Web Frame Face Angles.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.		
12						·30		4 × 3 × ·40	36	5	·40	8	2
14						·30		4½ × 3 × ·40	,,	,,	·40	,,	,,
16						·30		5 × 3 × ·40	,,	,,	·42	,,	,,
18						·30		5 × 3 × ·44	,,	,,	·44	,,	,,
20						·30	3 × 3 × ·30	5 × 3 × ·48	42	6	·46	10	2
22						·30	3 × 3 × ·34	5 × 3 × ·52	,,	,,	·48	,,	,,
24	25 × ·46					·32	3½ × 3 × ·36	5 × 3½ × ·54	,,	,,	·50	,,	,,
26	26 × ·48	29 × ·50				·34	3½ × 3 × ·40	6 × 3½ × ·56	,,	,,	·52	,,	,,
28	28 × ·48	30 × ·50	34 × ·52			·34	3½ × 3½ × ·42	6½ × 3½ × ·60	48	7	·54	12	4
30	29 × ·50	31 × ·50	35 × ·52	38 × ·54	40 × ·54	·36	3½ × 3½ × ·46	7 × 3½ × ·62	,,	,,	·56	,,	,,
32	30 × ·50	32 × ·50	36 × ·52	39 × ·54	41 × ·54	·38	3½ × 3½ × ·50	7 × 3½ × ·66	,,	,,	·58	,,	,,
34	31 × ·50	34 × ·52	38 × ·54	41 × ·54	43 × ·54	·40	4 × 3½ × ·50		,,	,,	,,	,,	,,
36	33 × ·50	36 × ·52	40 × ·54	42 × ·54	45 × ·56	·40	4 × 3½ × ·54		54	8	·60	,,	,,
38	35 × ·52	38 × ·54	41 × ·54	44 × ·56	47 × ·56	·42	4 × 3½ × ·58		,,	,,	·62	,,	,,
40	38 × ·52	40 × ·54	43 × ·54	46 × ·56	49 × ·56	·44	4½ × 3½ × ·58		,,	,,	·64	,,	,,
42	40 × ·54	42 × ·54	45 × ·56	48 × ·58	51 × ·58	·46	4½ × 3½ × ·62		,,	10	·66	,,	6
44	42 × ·54	44 × ·56	47 × ·56	50 × ·58	53 × ·60	·48	5 × 3½ × ·62		,,	,,	,,	,,	,,
46	43 × ·54	46 × ·56	48 × ·58	52 × ·60	55 × ·60	·48	5½ × 3½ × ·62		60	12	·68	14	8
48						·50	6 × 3½ × ·64		,,	,,	·70	,,	,,
50						·52	6 × 3½ × ·70		,,	,,	,,	,,	,,

PANTING ARRANGEMENTS.

DEEP FRAMES and INTERCOSTAL STRINGERS.

TABLE 5A

(SEE CONTINUATION.)

DEPTH D		DEPTH (d) AT COLLISION BULKHEAD FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF BEAMS AT SIDE OF LOWEST DECK.						
		Feet. 12	Feet. 14	Feet. 16	Feet. 18	Feet. 20	Feet. 22	Feet. 24
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12	BULB ANGLES ∧	5 ×3 ×·38	5½×3 ×·40	6 ×3 ×·42	6½×3 ×·46	7½×3 ×·40		
14		5½×3 ×·40	6 ×3 ×·40	6½×3 ×·40	7 ×3 ×·44	8 ×3 ×·40	8½×3 ×·42	
16		6½×3 ×·40	7 ×3 ×·40	7½×3 ×·40	8 ×3 ×·40	8½×3 ×·40	9 ×3 ×·44	9½×3½×·54
18		7 ×3 ×·42	7½×3 ×·42	8 ×3 ×·42	8½×3 ×·40	9 ×3 ×·44	9½×3½×·46	10 ×3½×·56
20		7½×3 ×·44	8 ×3 ×·44	8½×3 ×·40	9 ×3 ×·40	9 ×3 ×·52	10 ×3½×·46	10½×3½×·54
22		8 ×3 ×·46	8½×3 ×·42	9 ×3 ×·40	9 ×3 ×·52	9½×3½×·52	10½×3½×·46	11 ×3½×·56
24		8½×3 ×·48	9 ×3 ×·40	9 ×3 ×·52	9½×3½×·52	10 ×3½×·52	10½×3½×·56	11½×3½×·54
26		9 ×3 ×·48	9 ×3 ×·54	9½×3½×·52	10 ×3½×·52	10½×3½×·50	11 ×3½×·56	12 ×3½×·54
28		9½×3½×·48	9½×3½×·52	10 ×3½×·50	10½×3½×·50	11 ×3½×·48	11½×3½×·56	12×3½×3½×·50
30		10 ×3½×·48	10 ×3½×·54	10½×3½×·50	11 ×3½×·50	11½×3½×·50	12 ×3½×·54	12×3½×3½×·58
32		10 ×3½×·54	10½×3½×·56	11 ×3½×·52	11½×3½×·50	12 ×3½×·50	12×3½×3½×·50	12×4 ×4 ×·56
34		10½×3½×·56	11 ×3½×·58	11½×3½×·54	12 ×3½×·54	12 ×3½×·60	12×3½×3½×·56	13×4 ×4 ×·50
36		11 ×3½×·58	11½×3½×·60	12 ×3½×·58	12×3½×3½×·48	12×3½×3½×·56	12×4 ×4 ×·56	13×4 ×4 ×·56
38	∨	12 ×3½×·58	12×3½×3½×·48	12×3½×3½×·56	12×3½×3½×·60	12×4 ×4 ×·56	13×4 ×4 ×·52	14×4 ×4 ×·52
40	CHANNELS ∧	12×3½×3½×·54	12×4 ×4 ×·50	12×4 ×4 ×·56	12×4 ×4 ×·64	13×4 ×4 ×·56	14×4 ×4 ×·50	14×4 ×4 ×·60
42		13×4 ×4 ×·50	13×4 ×4 ×·52	13×4 ×4 ×·56	13×4 ×4 ×·64	14×4 ×4 ×·56	15×4 ×4 ×·52	15×4 ×4 ×·60
44		14×4 ×4 ×·50	14×4 ×4 ×·54	14×4 ×4 ×·58	14×4 ×4 ×·64	15×4 ×4 ×·56	15×4 ×4 ×·64	13×4 ×4 ×·50 4 ×4 ×·50
46	∨	15×4 ×4 ×·54	15×4 ×4 ×·58	15×4 ×4 ×·62	15×4 ×4 ×·68	13×4 ×4 ×·50 4 ×4 ×·50	13×4 ×4 ×·56 4 ×4 ×·56	14×4 ×4 ×·50 4 ×4 ×·50

PANTING ARRANGEMENTS.

DEEP FRAMES and INTERCOSTAL STRINGERS.

TABLE 5A

(CONCLUDED.)

DEPTH D		DEPTH (d) AT COLLISION BULKHEAD FROM TOP OF FLOORS AT CENTRE IN WAY OF SINGLE BOTTOMS, AND FROM TOP OF MARGIN PLATE IN WAY OF DOUBLE BOTTOMS, TO TOP OF BEAMS AT SIDE OF LOWEST DECK.					Thickness of Stringer Plate.	Face Angle on Stringer.
		Feet. 26	Feet. 28	Feet. 30	Feet. 32	Feet. 34		Sect Area.
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12	BULB ANGLES						·30	3 ×3 ×·30 1·41
14							·30	3 ×3 ×·34 1·92.
16							·32	3½ ×3 ×·34 2·09
18		11 ×3½ ×·56 32·9					·34	4 ×3 ×·34 2·26
20		11½ ×3½ ×·56 36·3.	12 ×3½ ×3½ ×·54 44·6				·34	4 ×3 ×·38 2·52
22		12 ×3½ ×·56 39·5	12 ×4 ×4 ×·52 44·2	13 ×4 ×4 ×·58 56·5			·36	4½ ×3 ×·40 2·84
24	CHANNELS	12 ×3½ ×3½ ×·50 43·0	13 ×4 ×4 ×·50 52·6	14 ×4 ×4 ×·54 60·8	15 ×4 ×4 ×·60 71·0		·38	5 ×3 ×·40 3·04
26		12 ×3½ ×3½ ×·58 46·2	13 ×4 ×4 ×·56 55·5	14 ×4 ×4 ×·60 64·2.	15 ×4 ×4 ×·68 76·1	13 ×4 ×4 ×·54 4 ×4 ×·54 95·0	·40	5½ ×3 ×·40 3·24
28		12 ×4 ×4 ×·58 50·1	13 ×4 ×4 ×·62 58·5	15 ×4 ×4 ×·56 65·4	13 ×4 ×4 ×·50 4 ×4 ×·50 90·7	14 ×4 ×4 ×·50 4 ×4 ×·50 100·0	·40	5½ ×3½ ×·42 3·6
30		13 ×4 ×4 ×·54 54·5	14 ×4 ×4 ×·56 61·4	15 ×4 ×4 ×·62 72·3	13 ×4 ×4 ×·56 4 ×4 ×·56 97·9	14 ×4 ×4 ×·54 4 ×4 ×·54 105·0	·42	6 ×3½ ×·42 3·81.
32		13 ×4 ×4 ×·60 57·5	14 ×4 ×4 ×·62 6	15 ×4 ×4 ×·68 76·3	14 ×4 ×4 ×·50 4 ×4 ×·50 100·0	14 ×4 ×4 ×·60 4 ×4 ×·60 118·0	·44	6 ×3½ ×·46 4·16
34		14 ×4 ×4 ×·54 60·8	15 ×4 ×4 ×·58 69·7	13 ×4 ×4 ×·52 4 ×4 ×·52 92·7	14 ×4 ×4 ×·54 4 ×4 ×·54 105·0	15 ×4 ×4 ×·52 4 ×4 ×·52 111·7	·44	6½ ×3½ ×·46 4·39
36		14 ×4 ×4 ×·58 63·0	15 ×4 ×4 ×·64 73·6	13 ×4 ×4 ×·58 4 ×4 ×·58 99·0	14 ×4 ×4 ×·58 4 ×4 ×·58 109·4	15 ×4 ×4 ×·58 4 ×4 ×·58 119·4	·46	7 ×3½ ×·48 4·81.
38		15 ×4 ×4 ×·56 68·4	13 ×4 ×4 ×·50 4 ×4 ×·50 90·4	14 ×4 ×4 ×·50 4 ×4 ×·50 100·0	15 ×4 ×4 ×·52 4 ×4 ×·52 111·4	15 ×4 ×4 ×·64 4 ×4 ×·64 124·2.	·48	7½ ×3½ ×·48 5·05
40		15 ×4 ×4 ×·64 73·6.	13 ×4 ×4 ×·58 4 ×4 ×·58 99·0	14 ×4 ×4 ×·58 4 ×4 ×·58 109·4	15 ×4 ×4 ×·58 4 ×4 ×·58 119·4		·48	8 ×3½ ×·48 5·29
42	CHANNEL WITH REVERSE	13 ×4 ×4 ×·52 4 ×4 ×·52 92·9	14 ×4 ×4 ×·52 4 ×4 ×·52 102·5	15 ×4 ×4 ×·52 4 ×4 ×·52 114·4			·50	8 ×3½ ×·52 5·71
44		14 ×4 ×4 ×·50 4 ×4 ×·50 100·0	14 ×4 ×4 ×·60 4 ×4 ×·60 118·8				·50	8½ ×3½ ×·54 6·19
46		14 ×4 ×4 ×·58 4 ×4 ×·58 109·4					·52	9 ×4 ×·54 6·73

DOUBLE BOTTOMS.

TABLE 6

(See Continuation.)

FIRST LONGITUDINAL NUMERAL. L × D	CENTRE GIRDER. Height Above Base Line. Full Scantling Vessels.	CENTRE GIRDER. Height Above Base Line. Complete Superstructure Vessels.	CENTRE GIRDER. Thickness. Half Length Amids.	CENTRE GIRDER. Thickness. At Ends.	CENTRE GIRDER. Thickness. In Boiler Room.	MARGIN PLATE. Thickness. In Holds and Engine Room.	MARGIN PLATE. Thickness. In Boiler Room.	FLOOR PLATES, SIDE GIRDERS AND BRACKETS INSIDE TANK. Thickness. In Holds and Engine Room.	FLOOR PLATES, SIDE GIRDERS AND BRACKETS INSIDE TANK. Thickness. In Boiler Room.	INNER BOTTOM PLATING. Middle Line Strake, except in Boiler Room. Breadth.	INNER BOTTOM PLATING. Middle Line Strake, except in Boiler Room. Thickness. Half Length Amids.	INNER BOTTOM PLATING. Middle Line Strake, except in Boiler Room. Thickness. At Ends.	INNER BOTTOM PLATING. Thickness. In Holds. Half Length Amids.	INNER BOTTOM PLATING. Thickness. In Holds. At Ends.	INNER BOTTOM PLATING. Thickness. In Engine Room.	INNER BOTTOM PLATING. Thickness. In Boiler Room, including Middle Line Strake.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
2100	29		·36	·30	·46	·30	·40	·28	·38	39	·32	·30	·28	·28	·32	·44
2600	30		·38	·32	·48	·32	·42	·28	·38	40	·34	·30	·30	·28	·34	·46
3150	31	29	·40	·34	·50	·34	·44	·30	·40	41	·34	·32	·30	·30	·34	·46
3800	32	30	·40	·34	·50	·36	·46	·30	·40	42	·36	·32	·32	·30	·36	·46
4500	33	31	·42	·36	·52	·36	·46	·32	·42	43	·38	·34	·32	·30	·38	·48
5250	34	32	·44	·36	·54	·38	·48	·32	·42	44	·38	·34	·34	·32	·38	·48
6050	35	33	·44	·36	·54	·40	·50	·34	·44	45	·40	·34	·34	·32	·40	·50
6800	36	34	·46	·38	·56	·40	·50	·34	·44	46	·42	·36	·36	·34	·42	·52
7550	37	35	·46	·38	·56	·42	·52	·34	·44	47	·42	·36	·36	·34	·42	·52
8350	38	36	·48	·38	·58	·42	·52	·36	·46	47	·44	·38	·38	·34	·44	·52
9150	39	37	·48	·40	·58	·44	·54	·36	·46	48	·46	·38	·40	·34	·46	·54
10000	40	38	·50	·40	·60	·46	·56	·36	·46	49	·48	·40	·40	·36	·48	·54
10900	41	39	·50	·40	·60	·48	·58	·38	·48	49	·48	·40	·40	·36	·48	·56
11800	42	40	·52	·42	·60	·50	·58	·38	·48	50	·50	·40	·42	·36	·50	·56
12750	43	41	·54	·44	·60	·50	·58	·40	·50	51	·50	·42	·42	·38	·50	·56
13750	44	42	·54	·44	·60	·52	·58	·40	·50	52	·50	·42	·42	·38	·50	·56
14850	45	43	·56	·46	·62	·54	·60	·42	·52	53	·52	·44	·44	·40	·52	·58
15900	46	44	·58	·46	·64	·54	·60	·42	·52	54	·52	·44	·44	·40	·52	·58
17000	47	45	·60	·48	·64	·56	·60	·44	·54	55	·54	·46	·46	·42	·54	·60
18200	48	46	·62	·48	·66	·56	·60	·44	·54	56	·56	·46	·48	·42	·56	·62
19500	49	47	·64	·50	·68	·58	·62	·46	·54	57	·58	·48	·50	·44	·58	·62
20900	50	48	·64	·50	·68	·60	·64	·46	·54	58	·58	·50	·50	·46	·58	·62
22400	51	49	·66	·52	·70	·62	·66	·48	·56	60	·60	·52	·52	·48	·60	·64
24000	52	50	·68	·54	·72	·64	·68	·48	·56	62	·62	·52	·54	·48	·62	·66
25700	53	51	·68	·54	·72	·66	·70	·50	·56	64	·64	·54	·54	·50	·64	·66
27500		52	·70	·56	·74	·68	·72	·50	·56	65	·66	·56	·56	·52	·64	·66
29400		53	·72	·58	·76	·68	·72	·50	·56	67	·68	·58	·56	·52	·66	·68
31400		54	·74	·60	·78	·70	·74	·52	·56	69	·70	·60	·58	·54	·66	·70
33600		55	·76	·62	·80	·70	·74	·52	·56	70	·70	·60	·58	·54	·66	·70
36000		56	·78	·64	·82	·72	·76	·52	·58	·72	·72	62	·60	·56	·68	·72
28600		57	·80	·66	·84	·72	·76	·54	·58	·74	72	62	·60	·56	·68	·72
41400		58	·82	·68	·84	·74	·78	·54	·60	·74	·74	64	·62	·58	·68	·72

DOUBLE BOTTOMS.

TABLE 6
(Concluded.)

FIRST LONGITUDINAL NUMERAL. L × D	DIMENSIONS OF ANGLE BARS. Angles Connecting Centre Girder to Flat Plate Keel. Half Length Amidships.	Angles Connecting Centre Girder to Flat Plate Keel. Thickness at Ends.	Angles Connecting Centre Girder to Inner Bottom. Half Length Amidships.	Angles Connecting Centre Girder to Inner Bottom. Thickness at Ends.	Angles Connecting Margin Plate to Shell Plating.	Frames and Reversed Frames on Floors, Side Girder Angles, Vertical Angles on Centre Girder and Margin Plate.	Vertical Angles Connecting Floors and Side Girders.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
2100	3 × 3 × ·36	·36	3 × 3 × ·32	·32	3 × 3 × ·32	3 × 3 × ·28	$2\frac{1}{2} \times 2\frac{1}{2} \times \cdot 28$
2600	3 × 3 × ·38	·38	3 × 3 × ·34	·34	3 × 3 × ·34	3 × 3 × ·28	$2\frac{1}{2} \times 2\frac{1}{2} \times \cdot 28$
3150	3 × 3 × ·40	·40	3 × 3 × ·36	·36	3 × 3 × ·36	3 × 3 × ·30	$2\frac{1}{2} \times 2\frac{1}{2} \times \cdot 28$
3800	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	·40	3 × 3 × ·38	·38	3 × 3 × ·38	3 × 3 × ·30	$2\frac{1}{2} \times 2\frac{1}{2} \times \cdot 30$
4500	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	·40	3 × 3 × ·40	·40	3 × 3 × ·40	3 × 3 × ·32	$2\frac{1}{2} \times 2\frac{1}{2} \times \cdot 30$
5250	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	·42	3 × 3 × ·40	·40	3 × 3 × ·40	3 × 3 × ·32	$2\frac{1}{2} \times 2\frac{1}{2} \times \cdot 30$
6050	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	·44	3 × 3 × ·42	·40	3 × 3 × ·42	3 × 3 × ·34	$2\frac{1}{2} \times 2\frac{1}{2} \times \cdot 32$
6800	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	·46	3 × 3 × ·42	·40	3 × 3 × ·42	3 × 3 × ·34	$2\frac{1}{2} \times 2\frac{1}{2} \times \cdot 32$
7550	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	·48	3 × 3 × ·44	·42	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 34$	$2\frac{1}{2} \times 2\frac{1}{2} \times \cdot 32$
8350	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	·48	3 × 3 × ·44	·42	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 36$	3 × 3 × ·34
9150	4 × 4 × ·52	·48	3 × 3 × ·46	·44	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 36$	3 × 3 × ·34
10000	4 × 4 × ·54	·50	3 × 3 × ·48	·46	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 38$	3 × 3 × ·34
10900	4 × 4 × ·54	·50	3 × 3 × ·50	·48	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	3 × 3 × ·36
11800	4 × 4 × ·56	·52	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	·48	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	3 × 3 × ·36
12750	4 × 4 × ·56	·52	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	·48	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	3 × 3 × ·38
13750	4 × 4 × ·58	·54	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	·48	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	3 × 3 × ·38
14850	4 × 4 × ·60	·56	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	·50	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	3 × 3 × ·40
15900	5 × 5 × ·62	·56	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	·50	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	3 × 3 × ·40
17000	5 × 5 × ·64	·58	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$	·52	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	3 × 3 × ·42
18200	5 × 5 × ·66	·60	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$	·52	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	3 × 3 × ·42
19500	5 × 5 × ·68	·62	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$	·54	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	3 × 3 × ·44
20900	5 × 5 × ·70	·64	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 60$	·56	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 60$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	3 × 3 × ·44
22400	5 × 5 × ·70	·64	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 62$	·56	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 62$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	3 × 3 × ·46
24000	5 × 5 × ·72	·64	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 64$	·58	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 64$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	3 × 3 × ·46
25700	5 × 5 × ·72	·64	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 66$	·60	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 66$	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	3 × 3 × ·48
27500	5 × 5 × ·74	·66	4 × 4 × ·68	·62	4 × 4 × ·68	4 × 4 × ·54	3 × 3 × ·48
29400	5 × 5 × ·76	·68	4 × 4 × ·70	·64	4 × 4 × ·70	4 × 4 × ·54	3 × 3 × ·48
31400	5 × 5 × ·78	·70	4 × 4 × ·72	·64	4 × 4 × ·72	4 × 4 × ·56	3 × 3 × ·50
33600	5 × 5 × ·80	·72	4 × 4 × ·74	·66	4 × 4 × ·74	4 × 4 × ·56	3 × 3 × ·50

In the boiler room the thicknesses of angle bars not covered by cement are to be increased by ·10 inch beyond those given in the Table.

BRACKET FLOORS in DOUBLE BOTTOMS.

TABLE 7

FULL SCANTLING VESSELS.

DEPTH. D		UNSUPPORTED SPAN.			
Feet.		Feet. 5	Feet. 6	Feet. 7	Feet. 8
Feet.		Inches.	Inches.	Inches.	Inches.
16	ANGLES	5½ × 3 × ·34	6½ × 3 × ·36	6 × 3 × ·38	6½ × 3 × ·40
18	ANGLES	6 × 3 × ·34	5½ × 3 × ·36	6 × 3 × ·44	7 × 3 × ·40
20	ANGLES	6½ × 3 × ·34	6 × 3 × ·36	6½ × 3 × ·44	7½ × 3 × ·38
22	ANGLES	6½ × 3½ × ·38	6 × 3½ × ·40	7 × 3½ × ·42	7½ × 3½ × ·44
24	BULB ANGLES	5½ × 3½ × ·34	6½ × 3½ × ·38	7 × 3½ × ·46	8 × 3½ × ·46
26	BULB ANGLES	5½ × 3½ × ·40	6½ × 3½ × ·44	7½ × 3½ × ·46	8½ × 3½ × ·46
28	BULB ANGLES	6 × 3½ × ·40	7 × 3½ × ·42	8 × 3½ × ·44	9 × 3½ × ·44
30	BULB ANGLES	6½ × 3½ × ·38	7½ × 3½ × ·40	8½ × 3½ × ·44	9 × 3½ × ·52
32	BULB ANGLES	6½ × 3½ × ·42	7½ × 3½ × ·44	8½ × 3½ × ·50	9½ × 3½ × ·52
34	BULB ANGLES	7 × 3½ × ·40	8 × 3½ × ·42	9 × 3½ × ·48	10 × 3½ × ·52
36	BULB ANGLES	7 × 3½ × ·44	8 × 3½ × ·50	9 × 3½ × ·54	10 × 3½ × ·58
38	BULB ANGLES	7½ × 3½ × ·42	8½ × 3½ × ·48	9½ × 3½ × ·52	10½ × 3½ × ·56
40	BULB ANGLES	7½ × 3½ × ·46	9 × 3½ × ·46	10 × 3½ × ·50	11 × 3½ × ·56
42	BULB ANGLES	8 × 3½ × ·46	9 × 3½ × ·52	10½ × 3½ × ·48	11½ × 3½ × ·54
44	BULB ANGLES	8 × 3½ × ·50	9½ × 3½ × ·52	10½ × 3½ × ·54	12 × 3½ × ·54
46	BULB ANGLES	8½ × 3½ × ·50	9½ × 3½ × ·56	11 × 3½ × ·56	12 × 3½ × ·60

COMPLETE SUPERSTRUCTURE VESSELS.

DEPTH. D		UNSUPPORTED SPAN.			
Feet.		Feet. 5	Feet. 6	Feet. 7	Feet. 8
Feet.		Inches.	Inches.	Inches.	Inches.
16	ANGLES	5 × 3 × ·36	6 × 3 × ·36	5½ × 3 × ·34	6 × 3 × ·40
18	ANGLES	5½ × 3 × ·34	6½ × 3 × ·36	6 × 3 × ·34	6½ × 3 × ·38
20	ANGLES	6 × 3 × ·34	5½ × 3 × ·34	6 × 3 × ·40	6½ × 3 × ·44
22	ANGLES	6 × 3½ × ·38	5½ × 3½ × ·38	6½ × 3½ × ·38	7 × 3½ × ·40
24	ANGLES	6½ × 3½ × ·36	6 × 3½ × ·36	6½ × 3½ × ·44	8 × 3½ × ·42
26	ANGLES	6½ × 3½ × ·40	6½ × 3½ × ·40	7 × 3½ × ·44	8 × 3½ × ·48
28	BULB ANGLES	5½ × 3½ × ·34	6½ × 3½ × ·38	7½ × 3½ × ·42	8 × 3½ × ·44
30	BULB ANGLES	5½ × 3½ × ·40	6½ × 3½ × ·44	7½ × 3½ × ·46	8½ × 3½ × ·46
32	BULB ANGLES	6 × 3½ × ·40	7 × 3½ × ·42	8 × 3½ × ·44	9 × 3½ × ·44
34	BULB ANGLES	6½ × 3½ × ·38	7½ × 3½ × ·40	8½ × 3½ × ·44	9 × 3½ × ·52
36	BULB ANGLES	6½ × 3½ × ·42	7½ × 3½ × ·44	8½ × 3½ × ·50	9½ × 3½ × ·52
38	BULB ANGLES	7 × 3½ × ·40	8 × 3½ × ·42	9 × 3½ × ·48	10 × 3½ × ·52
40	BULB ANGLES	7½ × 3½ × ·46	9 × 3½ × ·46	10 × 3½ × ·50	11 × 3½ × ·56
42	BULB ANGLES	8 × 3½ × ·46	9 × 3½ × ·52	10½ × 3½ × ·48	11½ × 3½ × ·54
44	BULB ANGLES	8 × 3½ × ·50	9½ × 3½ × ·52	10½ × 3½ × ·54	12 × 3½ × ·54
46	BULB ANGLES	8½ × 3½ × ·50	9½ × 3½ × ·56	11 × 3½ × ·56	12 × 3½ × ·60

The Frames are to have the scantlings given in the Tables. The Reversed Frames may be ½-inch less in depth than given in the Tables, and the horizontal flanges may be 3 inches in breadth.

In the boiler room the thicknesses of bars not covered by cement are to be increased by ·10 inch beyond those given in the Tables.

LLOYD'S REGISTER OF SHIPPING, LONDON.—13*th July*, 1922.

Reducing Spacing max allowance for 6"

Floors, intercostals - angles as D.B. .01 ve. 2" (max .03).
" " " " " "
Inner bottom

Bracket frames, reverse frames, frames, tween deck frames, beams, margin connection
Shear care to be paid to frames of 3/52. Shell in bottom forward to be rule thickness
Riveting as Rule thickness of shell.

TABLE 7A

DETAILS of BRACKET FLOORS in DOUBLE BOTTOMS.

DEPTH OF BULB ANGLE FRAME.	RIVETS IN BRACKETS. To close work efficiently		RIVETS IN EACH END OF VERTICAL BAR ON INTERCOSTAL GIRDER.		VERTICAL STRUTS BETWEEN INTERCOSTAL GIRDER AND CENTRE LINE OR MARGIN PLATE.	RIVETS IN EACH END OF VERTICAL STRUTS.		DEPTH OF BULB ANGLE FRAME.	NUMBER AND SIZE OF RIVETS IN BRACKETS.	NUMBER AND SIZE OF RIVETS IN EACH END OF VERTICAL BAR ON HORIZONTAL
	Number.	Diameter.	Number.	Diameter.	Channels.	Number.	Diameter.	INCHES.		
Inches. 5 and 5½ & all angles	5	Inches. ¾	2	Inches. ¾	Inches. 9 × 3½ × 3½ × ·38 6·84	4	Inches. ¾	5 AND 5½	5 AT ¾	2 AT ¾
6 „ 6½	6	¾	2	¾	10 × 3½ × 3½ × ·42 7·73	4	¾	6 " 6½	6 " ¾	2 " ¾
7 „ 7½	7	¾	3	¾	11 × 3½ × 3½ × ·46 8·61	5	¾	7 " 7½	7 " ¾	3 " ¾
8 „ 8½	8	¾	4	¾	11 × 3½ × 3½ × ·50 9·05	5	¾	8 " 8½	8 " ¾	4 " ¾
9 „ 9½	8	⅞	4	⅞	12 × 3½ × 3½ × ·54 10·16	6	⅞	9 " 9½	8 " ⅞	4 " ⅞
10 and above	9	⅞	4	⅞	12 × 4 × 4 × ·54 10·91	6	⅞	10 " ABOVE	9 " ⅞	4 " ⅞

Breadth of bracket flats : ¾ depth of centre Girder.

LLOYD'S REGISTER OF SHIPPING, LONDON.—25th *June*, 1925.

See Latest Rules

Web Framing Spacing

Floors +·02 every 3" or stiffened B.S. ·01 every 3"
Tank Knees " " " " " " " "
Open floor brackets ·02 every 3" " " " "
Inner bottom holds +·02 " 4 " " " "
" " CR " " " 6
Centre strake not to be less than Tank B/S.
Tank margin holds ·02 every 4" B.S. ·01 every 4"
Frame Brackets, reverse frames, frames, (Stiffrs) tween deck frames every, tween deck frames alt's & in side plating ·02 every 2', shell, beams, & knees, pillars stringers, deck plating & bhd stiffrs. Riveting for rule thickness, frame rivets where Rule spacing 28½" margin connections.
Reduced Frame Spacing Inner bottom plating, floors & intercostals — ·01" for each complete 2" reduction in framing spacing. (max reduction 6").

Sectional area of 3/4 rivet = .44
" " 7/8 " = .60.

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DEPTHS of MARGIN PLATES of DOUBLE BOTTOMS and ATTACHMENT of TANK SIDE BRACKETS to MARGIN PLATES.

TABLE 8

(See Continuation.)

DEPTH D.			DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF MARGIN PLATE TO LOWEST DECK AT SIDE.													
			Feet. 10							Feet. 14						
					Attachment outside Margin Plate.							Attachment outside Margin Plate.				
Full Scantling Vessels.	Complete Superstructure Vessels.	Height of Tank Side Brackets Above Base Line.	Thickness of Tank Side Brackets outside Tank.	Depth of Margin Plate.	Angle Attachment.	Gussets to Brackets.		Number and Diameter of Rivets in each Arm.		Thickness of Tank Side Brackets outside Tank.	Depth of Margin Plate.	Angle Attachment.	Gussets to Brackets.		Number and Diameter of Rivets in each Arm.	
						Abaft ¼-Length from Stem.	Forward of ¼-Length from Stem.	Angle.	Gusset.				Abaft ¼-Length from Stem.	Forward of ¼-Length from Stem.	Angle.	Gusset.
10 12 14		28 32 36	30 32	19 20						30 32	20 21.					
Feet.	Feet.	Inches.	Inches.	Inches.				No. Ins.	No. Ins.	Inches.	Inches.				No. Ins.	No. Ins.
16	19	40	·32	21	Single 2.2	—	—	5 of ¾ 2.2.	—	—	—	—	—	—	—	—
18	21	44	·34	22	„ 2.2.	—	—	5 „ ¾ 2.2	—	·34	23	Single 2.2	—	—	5 of ¾ 2.2	—
20	23	48	·34	23	„ 2.2	—	—	5 „ ¾ 2.2.	—	·36	24	„ 2.2	—	—	5 „ ¾ 2.2	—
22	25	52	·36	24	„ 2.2	—	—	5 „ ¾ 2.2	—	·38	25	„ 2.64	Every fifth frame 3.52.	Every third frame 5.86.	6 „ ¾ 2.64	4 of ¾ 1.46
24	27	55	·36	25	„ 2.64	Every fifth frame .44	Every third frame .73	6 „ ¾ 2.64	5 of ¾ 2.20.	·38	26	„ 2.64	Every fourth frame .55	Every second frame 1.10	6 „ ¾ 2.64	5 „ ¾ 2.20
26	29	58	·38	27	„ 2.64	„ .53.	„ .88	6 „ ¾ 2.64	6 „ ¾ 2.64	·40	28	„ 2.64	„ .66	„ 1.32	6 „ ¾ 2.64	6 „ ¾ 2.64
28	31	61	·40	29	„ 3.6	Every fourth frame .90	„ 1.2	6 „ ⅞ 3.60	6 „ ⅞ 3.60	·40	30	„ 3.6	Every third frame 1.20	Every frame 3.60	6 „ ⅞ 3.60	6 „ ⅞ 3.60
30	33	64	·42	31	„ 4.2	Every third frame 1.4	Every second frame 2.1	7 „ ⅞ 4.2.	7 „ ⅞ 4.20	·42	32	„ 4.2	1.8 Every second frame 2.8	„ 3.60	7 „ ⅞ 4.20	6 „ ⅞ 3.60
32	35	67	·44	33	„ 4.2	„ 1.6	„ 2.4	7 „ ⅞ 4.20	8 „ ⅞ 4.80	·44	34	„ 4.2	2.10 „ 3.0	„ 4.20	7 „ ⅞ 4.20	7 „ ⅞ 4.20
34	37	70	·46	35	„ 4.8	Every second frame 2.4	„ 2.4	8 „ ⅞ 4.8	8 „ ⅞ 4.8	·46	36	„ 4.8	4.2 Every frame 1.80	„ 4.20	8 „ ⅞ 4.8	7 „ ⅞ 4.20
36	40	73	·48	37	„ 4.8	„ 2.4	Every frame 4.8	8 „ ⅞ 4.8	8 „ ⅞ 4.8	·48	38	„ 4.8	4.8 „ 2.8	„ 4.8	8 „ ⅞ 4.8	8 „ ⅞ 4.8
38	42	76	·48	39	„ 4.8	Every frame 4.8	„ 4.8	8 „ ⅞ 4.8	8 „ ⅞ 4.8	·50	40	Double 8.4	3.0 „ 3.8	„ 3.0	7 „ ⅞ 4.2	5 „ ⅞ 3.0
40	44	79	·50	41	Double 8.4	„ 3.0	„ 3.0	7 „ ⅞ 4.2.	5 „ ⅞ 3.0.	·50	42	„ 9.6	„ 3.0	„ 3.0	8 „ ⅞ 4.8	5 „ ⅞ 3.0.
42	46	82	·50	43	„ 9.6	„ 3.0	„ 3.0	8 „ ⅞ 4.8	5 „ ⅞ 3.0	·52	44	„ 9.6	„ 3.6	„ 3.6	8 „ ⅞ 4.8	6 „ ⅞ 3.60
44	48	85	·52	45	„ 9.6	„ 3.6	„ 3.6	8 „ ⅞ 4.8	6 „ ⅞ 3.60	— ·52	— 46	— 9.6	— 4.2	8 ⅞ — 4.2	7. ⅞ —	—
46	50	88	·52	47	„ 9.6.	„ 4.2	„ 4.2.	8 „ ⅞ 4.8	7 „ ⅞ 4.20	— ·54	— 48	— 10.8	— 4.8	9 ⅞ — 4.2	—	—

You needs in frame when see Sec 10 CC 8E

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DEPTHS of MARGIN PLATES of DOUBLE BOTTOMS and ATTACHMENT of TANK SIDE BRACKETS to MARGIN PLATES.

TABLE 8
(Concluded.)

DEPTH D.		DEPTH (d) AT MIDDLE OF LENGTH FROM TOP OF MARGIN PLATE TO LOWEST DECK AT SIDE.																				
		Feet. 18							Feet. 22							Feet. 26 when d exceeds 26 and not 30 ft.						
				Attachment outside Margin Plate.							Attachment outside Margin Plate.							Attachment outside Margin Plate.				
					Gussets to Brackets.		Number and Diameter of Rivets in each Arm.					Gussets to Brackets.		Number and Diameter of Rivets in each Arm.					Gussets to Brackets.		Number and Diameter of Rivets in each Arm.	
Full Scantling Vessels.	Complete Superstructure Vessels.	Thickness of Tank Side Brackets outside Tank.	Depth of Margin Plate.	Angle Attachment.	Abaft ¼-Length from Stem.	Forward of ¼-Length from Stem.	Angle.	Gusset.	Thickness of Tank Side Brackets outside Tank.	Depth of Margin Plate.	Angle Attachment.	Abaft ¼-Length from Stem.	Forward of ¼-Length from Stem.	Angle.	Gusset.	Thickness of Tank Side Brackets outside Tank.	Depth of Margin Plate.	Angle Attachment.	Abaft ¼-Length from Stem.	Forward of ¼-Length from Stem.	Angle.	Gusset.
14		32	22	Single	Ev 4th	Ev 3rd																
Feet.	Feet.	Inches	Inches				No. Ins.	No. Ins.	Inches	Inches				No. Ins.	No. Ins.	Inches	Inches				No. Ins.	No. Ins.
16	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		34	23																			
18	21	—	—	—	—	—	—	—	—	—	Single —	Ev 4 —	Ev 3rd —	6 3/4	5 3/4	—	—	—	—	—	—	—
		36	24	2.2	4.4	5.8	5 3/4	4 3/4	38	25	2.64	5.5	4.4									
20	23	.36	25	Single	Every fourth frame	Every third frame	5 of ¾	4 of ¾	.38	26	Single	Every fourth frame	Every second frame	6 of ¾	6 of ¾	—	—	—	—	—	—	—
				2.2	4.4	5.86	2.2	1.76			2.64	.66	1.32	2.64	2.64	.42						
22	25	.38	26	„	Every third frame	Every second frame	6 „ ¾	5 „ ¾	.40	27	„	Every third frame	„	7 „ ¾	6 „ ¾	—	—	Single —	Ev 2nd —	Ev. —	7/8	6 4/8
				2.64	.43	1.10	2.64	2.20			3.04	.88	1.32	3.08	2.64	.42	2.9	4.2	1.8	3.6		
24	27	.38	27	„	„	„	6 „ ¾	6 „ ¾	.40	29	„	Every second frame	Every frame	7 „ ⅞	6 „ ⅞	—	—	Single —	Ev 2nd —	Ev. —	8 4/8	6 4/8
				2.64	.88	1.32	2.64	2.64			4.2	1.8	3.60	4.2	3.60	.42	3.1	4.8	1.8	3.6		
26	29	.40	29	„	Every second frame	Every frame	6 „ ⅞	6 „ ⅞	.42	31	„	„	„	7 „ ⅞	7 „ ⅞	.44	33	Single	Every frame	Every frame	8 of ⅞	7 of ⅞
				3.6	1.80	3.60	3.60	3.60			4.2	2.1	4.20	4.2	4.2			4.8	4.2	4.2	4.8	4.2
28	31	.42	31	„	„	„	7 „ ⅞	6 „ ⅞	.42	33	„	Every frame	„	8 „ ⅞	6 „ ⅞	.44	35	Double	„	„	6 „ ⅞	5 „ ⅞
				4.2	1.8	3.6	4.2	3.6			4.8	3.6	3.6	4.8	3.6			7.2	3.0	3.0	3.6	3.0
30	33	.44	33	„	Every frame	„	8 „ ⅞	6 „ ⅞	.44	35	„	„	„	8 „ ⅞	7 „ ⅞	.46	37	„	„	„	7 „ ⅞	5 „ ⅞
				4.8	3.6	3.6	4.8	3.6			4.8	4.2	4.2	4.8	4.2			8.4	3.0	3.0	4.2	3.0
32	35	.46	35	„	„	„	8 „ ⅞	7 „ ⅞	.46	37	„	„	„	8 „ ⅞	8 „ ⅞	.48	39	„	„	„	8 „ ⅞	6 „ ⅞
				4.8	4.2	4.2	4.8	4.2			4.8	4.8	4.8	4.8	4.8			9.6	3.6	3.6	4.8	3.6
34	37	.48	37	„	„	„	8 „ ⅞	8 „ ⅞	.48	39	Double	„	„	7 „ ⅞	5 „ ⅞	.50	41	„	„	„	8 „ ⅞	6 „ ⅞
				4.8	4.8	4.8	4.8	4.8			8.4	3.0	3.0	4.2	3.0			9.6	3.6	3.6	4.8	3.6
36	40	.50	39	Double	„	„	7 „ ⅞	5 „ ⅞	.50	41	„	„	„	8 „ ⅞	5 „ ⅞	.52	43	—	—	—	9 4/8	6 4/8
				8.4	3.0	3.0	4.2	3.0			9.6	3.0	3.0	4.8	3.0			9.6	4.2	4.2	5.4	3.6
38	42	.50	41	„	„	„	8 „ ⅞	5 „ ⅞	.50	43	„	„	„	8 „ ⅞	6 „ ⅞	.52	45	—	—	—	9 4/8	7 4/8
				9.6	3.0	3.0	4.8	3.0			9.6	3.6	3.6	4.8	3.6			10.8	4.2	4.2	5.4	4.2
40	44	.52	43	„	„	„	8 „ ⅞	6 „ ⅞	.52	45	—	—	—	9 7/8	6 7/8	—	47	—	—	—	9 4/8	8 4/8
				9.6	3.6	3.6	4.8				9.6	4.2	4.2	5.4	3.6	5.4		10.8	4.8	4.8	5.4	4.8
42	46	52	45				9 4/8	7 4/8	52	47				9 4/8	7 4/8						10 4/8	8 4/8
				9.6	3.6	3.6	5.4	4.2			10.8	4.2	4.2	5.4	4.2	5.6	49	12	4.8	4.8	6.0	4.8
44	48	54	47				9 4/8	7 4/8	54	49				9 4/8	8 4/8							
				10.8	4.2	4.2	5.4	4.2			10.8	4.8	4.8	5.4	4.8	5.8	51					
46	50	54	49				9 4/8	8 4/8						10 4/8	8 4/8							
				10.8	4.8	4.8	5.4	4.8	54	51	12.0	4.8	4.8	6.0	4.8	5.6	53					

FLOOR PLATES in VESSELS having SINGLE BOTTOMS.

FULL SCANTLING VESSELS. TABLE 9

DEPTH D.	BREADTH B.								
	Feet. 16	Feet. 20	Feet. 24	Feet. 28	Feet. 32	Feet. 36	Feet. 40	Feet. 44	Feet. 48
Feet. 10	Inches. 10 × ·24	Inches. 11 × ·26	Inches. 12 × ·28	Inches. 13 × ·28	Inches. 14 × ·30	Inches. 15 × ·30	Inches. 14 × ·32	Inches.	Inches.
12	"	12 × ·26	13 × ·28	14 × ·30	15 × ·30	17 × ·32	19 × ·34		
14			14 × ·28	15 × ·30	17 × ·32	19 × ·34	21 × ·36	23 × ·38	25 × ·40
16				17 × ·32	19 × ·34	21 × ·36	23 × ·38	24 × ·40	26 × ·42
18					20 × ·34	22 × ·38	24 × ·40	25 × ·42	27 × ·44
20					21 × ·36	23 × ·38	25 × ·40	26 × ·42	28 × ·44
22						24 × ·40	26 × ·42	27 × ·44	29 × ·46
24						25 × ·40	27 × ·42	28 × ·44	30 × ·46

COMPLETE SUPERSTRUCTURE VESSELS.

DEPTH D.	BREADTH B.						
	Feet. 24	Feet. 28	Feet. 32	Feet. 36	Feet. 40	Feet. 44	Feet. 48
Feet. 16	Inches. 13 × ·28	Inches. 14 × ·28	Inches. 16 × ·32	Inches. 18 × ·34	Inches. 19 × ·34	Inches. 20 × ·34	Inches.
18	14 × ·28	15 × ·30	17 × ·32	19 × ·34	20 × ·34	21 × ·36	
20			18 × ·34	20 × ·34	21 × ·36	22 × ·38	
22				21 × ·36	22 × ·38	24 × ·40	26 × ·42
24				22 × ·38	24 × ·40	25 × ·40	27 × ·42

In all vessels the thickness of the floors in the engine space is to be increased ·04 inch and in the boiler space ·10 inch beyond that given in the Tables.

KEELSONS in VESSELS with SINGLE BOTTOMS. TABLE 10

FIRST LONGITUDINAL NUMERAL. L×D	MIDDLE LINE KEELSONS. With Bar Keel only. Standing upon Floors. Double Bulb Angles.		With Bar Keel or Flat Plate Keel. Standing upon Floors with Intercostal Plates. Double Angles.			With Bar Keel or Flat Plate Keel. Standing upon Floors with Centre Through Plate. Double Angles.			FLAT KEEL PLATE. Double Angles.		SIDE KEELSONS. Double Angles.		
	For ½-Length Amids.	Thickness at Ends.	For ½-Length Amids.	Thickness at Ends.	Thickness of Intercostal Plates.	Throughout.	Thickness of Centre Through Plate and Foundation Plate. For ½-Length Amids.	Thickness of Centre Through Plate and Foundation Plate. Thickness at Ends.	For ½-Length Amids.	Thickness at Ends.	For ½-Length Amids.	Thickness at Ends.	Thickness of Intercostal Plates.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
600	5 ×3 ×·38	·38	3 ×3 ×·34	·26	·28	3 ×3 ×·26	·30	·26	3 ×3 ×·26	·26	3 ×3 ×·26	·24	·24
1100	5½×3 ×·40	·40	3½×3 ×·36	·28	·30	3½×3 ×·28	·32	·28	3½×3½×·30	·30	3½×3 ×·28	·26	·26
1650	6 ×3 ×·42	·42	4 ×3 ×·38	·28	·32	3½×3 ×·30	·34	·30	3½×3½×·36	·36	4 ×3 ×·30	·28	·28
2250	6½×3 ×·46	·44	4½×3 ×·40	·30	·34	4 ×3 ×·32	·38	·34	3½×3½×·40	·40	4½×3 ×·32	·28	·30
2900	7 ×3 ×·50	·46	4½×3½×·42	·32	·36	4 ×3½×·32	·40	·36	3½×3½×·44	·44	4½×3 ×·34	·30	·32
3650	7½×3½×·52	·48	5 ×3½×·44	·34	·38	4½×3½×·34	·42	·36	3½×3½×·48	·46	5 ×3 ×·36	·32	·34
4450	8 ×3½×·56	·50	5½×3½×·46	·36	·40	4½×3½×·36	·44	·38	4 ×4 ×·50	·46	5½×3½×·38	·34	·36
5450	8½×3½×·60	·52	6 ×3½×·48	·38	·42	4½×3½×·38	·46	·40	4 ×4 ×·52	·48	5½×3½×·40	·34	·38
6500	9 ×3½×·64	·54	6½×3½×·50	·40	·44	5 ×3½×·40	·48	·40	4 ×4 ×·54	·50	6 ×3½×·42	·36	·40
7700	9½×3½×·66	·56	7 ×3½×·50	·40	·46	6 ×3½×·42	·48	·40	4 ×4 ×·56	·50	6 ×3½×·46	·38	·40

CENTRE and SIDE KEELSONS in TUGS. TABLE 11

FIRST LONGITUDINAL NUMERAL. L×D	CENTRE KEELSON ON TOP OF FLOORS. Single Channel.	Double Bulb Angles.	SIDE KEELSON ON TOP OF FLOORS. Single Angle.	FIRST LONGITUDINAL NUMERAL. L×D	CENTRE KEELSON ON TOP OF FLOORS. Single Channel.	Double Bulb Angles.	SIDE KEELSON ON TOP OF FLOORS. Single Angle.
	Inches.	Inches.	Inches.		Inches.	Inches.	Inches.
850	8×3½×3½×·40	6×3 ×·38	5×3×·38	1700	12×3½×3½×·48	8×3½×·42	5×4×·40
1050	9×3½×3½×·42	6×3 ×·40	5×4×·38	2000	12×3½×3½×·50	8×3½×·44	5×4×·42
1250	10×3½×3½×·44	6×3½×·42	5×4×·38	2300		8×3½×·46	5×4×·46
1450	11×3½×3½×·46	7×3½×·42	5×4×·38	2600		8×3½×·50	5×4×·50

In the boiler room the thicknesses of the centre and side keelson plates and bars not covered by cement are to be increased by ·10 inch beyond those given in Tables 10 and 11.

LLOYD'S REGISTER OF SHIPPING, LONDON.—16*th June*, 1927.

TABLE 12

BEAMS fitted to EVERY FRAME.

(See Continuation.)

BREADTH OF DECK AMIDSHIPS.	SPACING OF BEAMS.		BEAMS AT UPPER DECKS OF SINGLE DECK VESSELS.				BEAMS AT UPPER DECKS IN FULL SCANTLING VESSELS HAVING MORE THAN ONE DECK, IN COMPLETE SUPERSTRUCTURE VESSELS FORWARD OF ¼th LENGTH FROM FORWARD AND AT FORECASTLE DECKS.			
			SIZE OF BEAMS AMIDSHIPS.			Thickness of Beam Knees.	SIZE OF BEAMS AMIDSHIPS.			Thickness of Beam Knees.
			With One Row of Pillars.	With Two Rows of Pillars.	With Three Rows of Pillars.		With One Row of Pillars.	With Two Rows of Pillars.	With Three Rows of Pillars.	
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
20	21	ANGLES	4 × 3 × ·30	3½ × 3 × ·28	3 × 3 × ·26	·30				
22	21	ANGLES	4 × 3 × ·32	3½ × 3 × ·30	3 × 3 × ·28	·30				
24	21½	ANGLES	4½ × 3 × ·32	4 × 3 × ·30	3 × 3 × ·30	·32	4½ × 3 × ·30	3½ × 3 × ·30	3 × 3 × ·30	·30
26	22	ANGLES	5 × 3 × ·32	4½ × 3 × ·30	3½ × 3 × ·30	·32	5 × 3 × ·30	4 × 3 × ·30	3½ × 3 × ·30	·30
28	22	ANGLES	5½ × 3 × ·32	4½ × 3 × ·34	3½ × 3 × ·30	·32	5 × 3 × ·32	4 × 3 × ·32	3½ × 3 × ·30	·32
30	22½	ANGLES	6 × 3 × ·34	5 × 3 × ·34	4 × 3 × ·30	·34	5 × 3 × ·34	4½ × 3 × ·32	4 × 3 × ·30	·32
32	22½	BULB ANGLES	5½ × 3 × ·34	5 × 3 × ·36	4 × 3 × ·32	·34	5½ × 3 × ·34	5 × 3 × ·32	4 × 3 × ·32	·34
34	23	BULB ANGLES	6 × 3 × ·36	5½ × 3 × ·36	4 × 3 × ·34	·36	6 × 3 × ·36	5 × 3 × ·34	4 × 3 × ·34	·34
36	23½	BULB ANGLES	6½ × 3 × ·38	6 × 3 × ·36	4½ × 3 × ·34	·38	5½ × 3 × ·34	5½ × 3 × ·34	4½ × 3 × ·34	·34
38	24	BULB ANGLES	7 × 3 × ·42	5½ × 3 × ·36	5 × 3 × ·34	·40	6 × 3 × ·36	6 × 3 × ·36	5 × 3 × ·34	·36
40	24½	BULB ANGLES	7½ × 3 × ·44	6 × 3 × ·36	5½ × 3 × ·34	·42	6½ × 3 × ·36	6½ × 3 × ·36	5½ × 3 × ·34	·36
42	25	BULB ANGLES	8 × 3 × ·44	6 × 3 × ·40	5½ × 3 × ·36	·44	7 × 3 × ·38	5½ × 3 × ·34	5½ × 3 × ·36	·38
44	25½	BULB ANGLES	8½ × 3½ × ·46	6½ × 3½ × ·40	6 × 3 × ·36	·46	7½ × 3 × ·40	6 × 3 × ·34	6 × 3 × ·36	·38
46	26	BULB ANGLES	9 × 3½ × ·48	7 × 3½ × ·40	5½ × 3 × ·34	·48	8 × 3 × ·42	6 × 3 × ·38	5½ × 3 × ·34	·40
48	27	BULB ANGLES	9½ × 3½ × ·50	7½ × 3½ × ·40	6 × 3½ × ·36	·50	8½ × 3 × ·44	6½ × 3 × ·38	6 × 3 × ·36	·40
50	28	BULB ANGLES	10 × 3½ × ·52	7½ × 3½ × ·44	6 × 3½ × ·40	·52	9 × 3½ × ·46	7 × 3½ × ·40	6 × 3½ × ·40	·42
52	28½	BULB ANGLES	10½ × 3½ × ·54	8 × 3½ × ·44	6½ × 3½ × ·40	·52	9½ × 3½ × ·48	7 × 3½ × ·46	6½ × 3½ × ·40	·44
54	29	BULB ANGLES	11 × 3½ × ·54	8 × 3½ × ·48	7 × 3½ × ·42	·54	10 × 3½ × ·50	7½ × 3½ × ·46	7 × 3½ × ·42	·46
56	29½	BULB ANGLES		8½ × 3½ × ·48	7½ × 3½ × ·42	·54	10½ × 3½ × ·50	8 × 3½ × ·46	7½ × 3½ × ·42	·46
58	30	BULB ANGLES		8½ × 3½ × ·52	7½ × 3½ × ·46	·56	10½ × 3½ × ·54	8 × 3½ × ·52	7½ × 3½ × ·46	·48
60	31	BULB ANGLES		9 × 3½ × ·52	8 × 3½ × ·46	·56	11 × 3½ × ·54	8½ × 3½ × ·54	8 × 3½ × ·46	·48
62	32	BULB ANGLES						9 × 3½ × ·52	8 × 3½ × ·48	·48
64	32½	BULB ANGLES						9 × 3½ × ·54	8½ × 3½ × ·46	·50
66	33	BULB ANGLES						9½ × 3½ × ·54	8½ × 3½ × ·48	·50
68	33½	BULB ANGLES							9 × 3½ × ·46	·50
70	34	BULB ANGLES							9 × 3½ × ·48	·52
72	34½	BULB ANGLES							9 × 3½ × ·50	·52
74	35	BULB ANGLES							9½ × 3½ × ·50	·52
76	35½	BULB ANGLES							9½ × 3½ × ·54	·54
78	36	BULB ANGLES							10 × 3½ × ·52	·54
80	36	BULB ANGLES							10 × 3½ × ·54	·56

TABLE 12

BEAMS fitted to EVERY FRAME.

(See Continuation.)

BREADTH OF DECK AMIDSHIPS.	SPACING OF BEAMS.		BEAMS AT UPPER DECKS ABAFT $\frac{1}{8}$th LENGTH FROM FORWARD IN COMPLETE SUPERSTRUCTURE VESSELS, AT LONG BRIDGES AND AT POOP DECKS COVERING MACHINERY OPENINGS.				BEAMS AT SHORT BRIDGES AND AT POOP DECKS NOT COVERING MACHINERY OPENINGS.			
			SIZE OF BEAMS AMIDSHIPS.			Thickness of Beam Knees.	SIZE OF BEAMS AMIDSHIPS.			Thickness of Beam Knees.
			With One Row of Pillars.	With Two Rows of Pillars.	With Three Rows of Pillars.		With One Row of Pillars.	With Two Rows of Pillars.	With Three Rows of Pillars.	
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
20	21	ANGLES								
22	21									
24	$21\frac{1}{2}$		$4 \times 3 \times .30$	$3\frac{1}{2} \times 3 \times .30$	$3 \times 3 \times .30$	.30				
26	22		$4\frac{1}{2} \times 3 \times .30$	$4 \times 3 \times .30$	$3\frac{1}{2} \times 3 \times .30$	.30	$3\frac{1}{2} \times 3 \times .28$	$3 \times 3 \times .28$	$3 \times 3 \times .26$	.30
28	22		$5 \times 3 \times .30$	$4 \times 3 \times .30$	$3\frac{1}{2} \times 3 \times .30$	.32	$3\frac{1}{2} \times 3 \times .30$	$3 \times 3 \times .30$	$3 \times 3 \times .28$	.30
30	$22\frac{1}{2}$		$5 \times 3 \times .32$	$4\frac{1}{2} \times 3 \times .30$	$4 \times 3 \times .30$	.32	$4 \times 3 \times .30$	$3\frac{1}{2} \times 3 \times .30$	$3 \times 3 \times .30$	.30
32	$22\frac{1}{2}$		$5 \times 3 \times .34$	$4\frac{1}{2} \times 3 \times .32$	$4 \times 3 \times .32$	.34	$4\frac{1}{2} \times 3 \times .30$	$4 \times 3 \times .30$	$3\frac{1}{2} \times 3 \times .30$	.30
34	23		$5\frac{1}{2} \times 3 \times .34$	$4\frac{1}{2} \times 3 \times .34$	$4 \times 3 \times .34$	.34	$4\frac{1}{2} \times 3 \times .34$	$4 \times 3 \times .32$	$3\frac{1}{2} \times 3 \times .30$	.32
36	$23\frac{1}{2}$		$6 \times 3 \times .36$	$5 \times 3 \times .34$	$4\frac{1}{2} \times 3 \times .34$	.34	$5 \times 3 \times .34$	$4\frac{1}{2} \times 3 \times .32$	$4 \times 3 \times .30$	.32
38	24	BULB ANGLES	$5\frac{1}{2} \times 3 \times .34$	$5\frac{1}{2} \times 3 \times .34$	$5 \times 3 \times .34$	.36	$5\frac{1}{2} \times 3 \times .34$	$4\frac{1}{2} \times 3 \times .34$	$4 \times 3 \times .30$	.34
40	$24\frac{1}{2}$		$6 \times 3 \times .36$	$6 \times 3 \times .34$	$5\frac{1}{2} \times 3 \times .34$	.36	$6 \times 3 \times .36$	$5 \times 3 \times .34$	$4 \times 3 \times .32$	.34
42	25		$6\frac{1}{2} \times 3 \times .36$	$6\frac{1}{2} \times 3 \times .36$	$5\frac{1}{2} \times 3 \times .36$	.38	$5\frac{1}{2} \times 3 \times .34$	$5\frac{1}{2} \times 3 \times .34$	$4\frac{1}{2} \times 3 \times .32$	.34
44	$25\frac{1}{2}$		$7 \times 3 \times .38$	$5\frac{1}{2} \times 3 \times .36$	$6 \times 3 \times .36$	.38	$6 \times 3 \times .34$	$6 \times 3 \times .34$	$5 \times 3 \times .32$	.36
46	26		$7\frac{1}{2} \times 3 \times .40$	$6 \times 3 \times .36$	$5\frac{1}{2} \times 3 \times .34$	.40	$6 \times 3 \times .40$	$6\frac{1}{2} \times 3 \times .34$	$5\frac{1}{2} \times 3 \times .32$	.36
48	27		$8 \times 3 \times .40$	$6 \times 3 \times .40$	$6 \times 3 \times .36$	.40	$6\frac{1}{2} \times 3 \times .40$	$5\frac{1}{2} \times 3 \times .34$	$6 \times 3 \times .32$	.38
50	28		$8\frac{1}{2} \times 3\frac{1}{2} \times .42$	$6\frac{1}{2} \times 3\frac{1}{2} \times .40$	$6 \times 3\frac{1}{2} \times .40$	.42	$7 \times 3 \times .40$	$6 \times 3 \times .34$	$6 \times 3 \times .36$	.38
52	$28\frac{1}{2}$		$9 \times 3\frac{1}{2} \times .44$	$7 \times 3\frac{1}{2} \times .40$	$6\frac{1}{2} \times 3\frac{1}{2} \times .40$	.44	$7\frac{1}{2} \times 3 \times .42$	$6\frac{1}{2} \times 3 \times .34$	$5\frac{1}{2} \times 3 \times .34$	.40
54	29		$9 \times 3\frac{1}{2} \times .48$	$7\frac{1}{2} \times 3\frac{1}{2} \times .42$	$7 \times 3\frac{1}{2} \times .42$	.46	$8 \times 3 \times .44$	$6\frac{1}{2} \times 3 \times .38$	$5\frac{1}{2} \times 3 \times .36$	.40
56	$29\frac{1}{2}$		$9\frac{1}{2} \times 3\frac{1}{2} \times .48$	$8 \times 3\frac{1}{2} \times .42$	$7\frac{1}{2} \times 3\frac{1}{2} \times .42$	.46	$8\frac{1}{2} \times 3 \times .46$	$7 \times 3 \times .38$	$6 \times 3 \times .34$	.40
58	30		$9\frac{1}{2} \times 3\frac{1}{2} \times .54$	$8 \times 3\frac{1}{2} \times .46$	$7\frac{1}{2} \times 3\frac{1}{2} \times .46$	.48		$7\frac{1}{2} \times 3 \times .38$	$6 \times 3 \times .36$	.42
60	31		$10 \times 3\frac{1}{2} \times .54$	$8\frac{1}{2} \times 3\frac{1}{2} \times .46$	$8 \times 3\frac{1}{2} \times .46$	.48		$8 \times 3 \times .40$	$6\frac{1}{2} \times 3 \times .36$	.42
62	32			$8\frac{1}{2} \times 3\frac{1}{2} \times .48$	$8 \times 3\frac{1}{2} \times .48$	.48		$8\frac{1}{2} \times 3 \times .40$	$6\frac{1}{2} \times 3 \times .40$	.42
64	$32\frac{1}{2}$			$9 \times 3\frac{1}{2} \times .48$	$8\frac{1}{2} \times 3\frac{1}{2} \times .46$	.50		$9 \times 3 \times .42$	$7 \times 3 \times .40$	.44
66	33			$9 \times 3\frac{1}{2} \times .52$	$8\frac{1}{2} \times 3\frac{1}{2} \times .48$	.50			$7 \times 3 \times .42$	.44
68	$33\frac{1}{2}$				$9 \times 3\frac{1}{2} \times .46$	.50			$7\frac{1}{2} \times 3 \times .40$	.44
70	34				$9 \times 3\frac{1}{2} \times .48$	.52			$7\frac{1}{2} \times 3 \times .42$	.46
72	$34\frac{1}{2}$				$9 \times 3\frac{1}{2} \times .50$	.52			$8 \times 3 \times .40$	.46
74	35				$9\frac{1}{2} \times 3\frac{1}{2} \times .50$	.52			$8 \times 3 \times .44$	.48
76	$35\frac{1}{2}$				$9\frac{1}{2} \times 3\frac{1}{2} \times .54$	.54			$8\frac{1}{2} \times 3 \times .44$	.48
78	36				$10 \times 3\frac{1}{2} \times .52$	.54			$9 \times 3 \times .44$	.50
80	36				$10 \times 3\frac{1}{2} \times .54$	.56			$9 \times 3 \times .48$	.50

TABLE 12 (Concluded.)

BEAMS fitted to EVERY FRAME.

BREADTH OF DECK AMIDSHIPS.	SPACING OF BEAMS.		BEAMS AT ALL DECKS ON WHICH CARGO IS CARRIED.			
			SIZE OF BEAMS AMIDSHIPS.			Thickness of Beam Knees.
			With One Row of Pillars.	With Two Rows of Pillars.	With Three Rows of Pillars.	
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.
20	21	ANGLES				
22	21					
24	21½		2.44	1.61		
26	22		5½ × 3 × ·30 3.06	4½ × 3 × ·30 2.08	3½ × 3 × ·30 1.30	·30
28	22		6 × 3 × ·30 3.68	5 × 3 × ·30 2.55	3½ × 3 × ·30 1.30	·32
30	22½		6 × 3 × ·36 4.31	5½ × 3 × ·30 3.06	4 × 3 × ·30 1.64	·32
32	22½	BULB ANGLES	5½ × 3 × ·34 3.95	5½ × 3 × ·32 3.24	4 × 3 × ·32 1.98	·34
34	23		6 × 3 × ·36 4.30	6 × 3 × ·32 3.89	4 × 3 × ·34 1.89	·36
36	23½		6½ × 3 × ·38 8.95	6 × 3 × ·36 4.31	4½ × 3 × ·34 2.34	·36
38	24		7 × 3 × ·40 10.60	5½ × 3 × ·34 5.95	5 × 3 × ·34 2.86	·38
40	24½		7½ × 3 × ·40 12.30	6 × 3 × ·34 7.30	5½ × 3 × ·34 3.44	·38
42	25		8 × 3 × ·40 14.15	6 × 3 × ·38 7.30	5½ × 3 × ·36 3.63	·40
44	25½		8½ × 3 × ·42 16.45	6½ × 3 × ·38 8.75	6 × 3 × ·36 4.31	·42
46	26		9 × 3 × ·44 19.20	7 × 3 × ·38 10.35	5½ × 3 × ·34 5.95	·44
48	27		9½ × 3½ × ·46 21.85	7½ × 3 × ·38 12.05	6 × 3 × ·36 7.30	·44
50	28		10 × 3½ × ·48 24.85	7½ × 3 × ·42 12.55	6 × 3 × ·40 7.65	·46
52	28½		10½ × 3½ × ·50 28.50	8 × 3 × ·42 14.45	6½ × 3 × ·40 8.95	·46
54	29		11 × 3½ × ·50 31.40	8 × 3 × ·46 15.00	7 × 3 × ·42 10.80	·46
56	29½		11½ × 3½ × ·52 35.3	8½ × 3 × ·46 17.05	7½ × 3 × ·42 12.35	·48
58	30		35.3 39.5	8½ × 3 × ·50 17.70	7½ × 3 × ·46 13.05	·48
60	31		42.2	9 × 3 × ·50 20.20	8 × 3 × ·46 15.00	·48
62	32		46.2	9 × 3 × ·54 20.90	8 × 3 × ·48 15.26	·48
64	32½		50.0	9½ × 3½ × ·54 23.65	8½ × 3 × ·46 17.05	·50
66	33		54.2	10 × 3½ × ·54 26.30	8½ × 3 × ·48 17.35	·50
68	33½		34 57.0	25 28.0	17 9 × 3 × ·46 19.85	·50
70	34		63.2	29.5	9 × 3 × ·48 19.85	·52
72	34½		68.5	31.9	9 × 3 × ·50 20.2	·52
74	35		73.4	34.1	9½ × 3½ × ·50 22.45	·52
76	35½		79.0	36.8	9½ × 3½ × ·54 23.65	·54
78	36		84.5	38.9	10 × 3½ × ·52 25.80	·54
80	36		89.0	41.1	10 × 3½ × ·54 26.30	·56

Section 15.

Beams to be fitted at every frame.

I At all W.T.

II At upper decks of all single deck ships above 15'0 deep.

III At unsheathed strength decks

IV At all decks where frame spacing exceeds 30"

Beams formed 3/6 L and at peaks — Strength: Table 1/y. $\frac{\text{Rule frame spacing of ship}}{\text{Table beam spacing}}$.

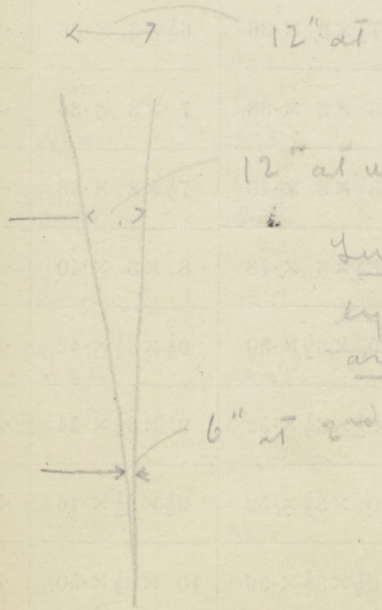
Half Beams when at every frame - to have angle lugs to scarfings
" " alt " " " double " " "
8" beams & less 2 rows
8½"-11" " 3 "
12 " 4

Beams as Horizontal Stiffs in W.T. Bhds Crown of Deep Tanks.
Peak Tanks & Oil fuel Tanks Tunnel recess.

I Beams to be fitted at every frame.

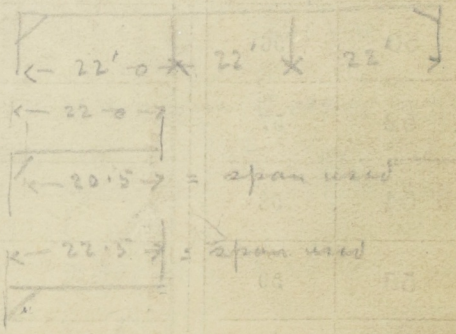
II Scantlings are to be sufficient to support the cargo load & not less in any case than the Table beams & scantlings of the stiffs in the boundary bulkhead

III In Deep Tanks, Peak Tanks, Oil fuel bunkers the beams should also be strong enough to stand a stress of 10-11 Tons under test.



For Sunger dk vessels (but not R.C.B. ships)
1/3 Beams not to be less than 3 sum sizes.

Half Beams
Where 2 R pillars fitted & deck breadth is not more than B/3 span of beam may be taken as half width of Rec



For 3 R. vessels
Where beams less than 2 R sizes allow ½ Beams

BEAMS fitted to ALTERNATE FRAMES.

TABLE 13
(See Continuation.)

BREADTH OF DECK AMIDSHIPS.	SPACING OF BEAMS.		BEAMS AT UPPER DECKS OF SINGLE DECK VESSELS.				BEAMS AT UPPER DECKS IN FULL SCANTLING VESSELS HAVING MORE THAN ONE DECK, IN COMPLETE SUPERSTRUCTURE VESSELS FORWARD OF $\frac{1}{4}$th LENGTH FROM FORWARD, AND AT FORECASTLE DECKS.			
			SIZE OF BEAMS AMIDSHIPS.			Thickness of Beam Knees.	SIZE OF BEAMS AMIDSHIPS.			Thickness of Beam Knees.
			With One Row of Pillars.	With Two Rows of Pillars.	With Three Rows of Pillars.		With One Row of Pillars.	With Two Rows of Pillars.	With Three Rows of Pillars.	
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
20	42	ANGLES	$5\frac{1}{2}\times3\times\cdot32$ 3.26	5 ×3×·32 2.70	4 ×3×·30 1.64	·30			Beams on Peak all Frame.	
22	42		$5\frac{1}{2}\times3\times\cdot36$ 3.63	5 ×3×·34 2.86	4 ×3×·32 1.78	·30				
24	43		6 ×3×·36 4.31	$5\frac{1}{2}\times3\times\cdot34$ 3.44	$4\frac{1}{2}\times3\times\cdot32$ 2.21	·32	6 ×3 ×·36 4.31	5 ×3 ×·32 2.70	$4\frac{1}{2}\times3$ ×·32 2.21	·30
26	44		$6\frac{1}{2}\times3\times\cdot36$ 5.0	6 ×3×·34 4.09	5 ×3×·32 2.70	·32	6 ×3 ×·40 4.45	$5\frac{1}{2}\times3$ ×·32 3.26	5 ×3 ×·32 2.70	·30
28	44		6 ×3×·34 7.15	$6\frac{1}{2}\times3\times\cdot34$ 4.72	5 ×3×·34 2.86	·34	$6\frac{1}{2}\times3$ ×·36 5.00	6 ×3 ×·32 3.84	5 ×3 ×·34 2.86	·32
30	45		$6\frac{1}{2}\times3\times\cdot34$ 8.36	$5\frac{1}{2}\times3\times\cdot34$ 5.95	$5\frac{1}{2}\times3\times\cdot32$ 3.26	·36	$5\frac{1}{2}\times3$ ×·34 5.95	6 ×3 ×·36 4.31	$5\frac{1}{2}\times3$ ×·32 3.26	·34
32	45		$7\frac{1}{2}\times3\times\cdot36$ 11.80	$5\frac{1}{2}\times3\times\cdot38$ 6.25	$5\frac{1}{2}\times3\times\cdot36$ 3.63	·38	6 ×3 ×·34 7.15	$6\frac{1}{2}\times3$ ×·36 5.00	$5\frac{1}{2}\times3$ ×·36 3.63	·36
34	46		8 ×3×·42 14.45	6 ×3×·38 7.50	6 ×3×·36 4.31	·40	$6\frac{1}{2}\times3$ ×·40 8.95	$5\frac{1}{2}\times3$ ×·34 5.95	6 ×3 ×·36 4.31	·36
36	47		$8\frac{1}{2}\times3\times\cdot48$ 14.35	$6\frac{1}{2}\times3\times\cdot38$ 8.75	$6\frac{1}{2}\times3\times\cdot36$ 5.00	·42	$7\frac{1}{2}\times3$ ×·36 11.80	6 ×3 ×·34 7.15	$6\frac{1}{2}\times3$ ×·36 5.00	·38
38	48						8 ×3 ×·42 14.45	$6\frac{1}{2}\times3$ ×·34 8.35	$5\frac{1}{2}\times3$ ×·34 5.95	·38
40	49						$8\frac{1}{2}\times3$ ×·46 17.05	7 ×3 ×·34 9.90	6 ×3 ×·34 7.15	·40
42	50						9 ×3 ×·52 20.55	$7\frac{1}{2}\times3$ ×·36 11.80	$6\frac{1}{2}\times3$ ×·36 8.55	·42
44	51						10 ×$3\frac{1}{2}$×·48 24.85	8 ×3 ×·38 13.85	7 ×3 ×·36 10.10	·44
46	52						$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 29.00	8 ×3 ×·46 18.00	$7\frac{1}{2}\times3$ ×·38 12.05	·46
48	54						11 ×$3\frac{1}{2}$×·58 33.3	$8\frac{1}{2}\times3$ ×·48 17.35	8 ×3 ×·40 14.15	·48
50	56						12 ×$3\frac{1}{2}$×·56 39.5	9 ×$3\frac{1}{2}$×·50 20.20	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot42$ 16.50	·50
52	57						43.9 43.5	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 23.20	9 ×$3\frac{1}{2}$×·44 19.20	·52
54	58						48.3	10 ×$3\frac{1}{2}$×·52 25.80	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 24.85	·52
56	59							$10\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 31.00	10 ×$3\frac{1}{2}$×·50 25.25	·54
58	60	BULB ANGLES						11 ×$3\frac{1}{2}$×·56 32.90	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 29.00	·54

This column for painting beams & coam

BEAMS fitted to ALTERNATE FRAMES.

TABLE 13
(See Continuation.)

BREADTH OF DECK AMIDSHIPS.	SPACING OF BEAMS.		BEAMS AT UPPER DECKS ABAFT $\frac{1}{8}$th LENGTH FROM FORWARD IN COMPLETE SUPERSTRUCTURE VESSELS, AT LONG BRIDGES AND AT POOP DECKS COVERING MACHINERY OPENINGS.				BEAMS AT SHORT BRIDGES AND AT POOP DECKS NOT COVERING MACHINERY OPENINGS.			
			SIZE OF BEAMS AMIDSHIPS.			Thickness of Beam Knees.	SIZE OF BEAMS AMIDSHIPS.			Thickness of Beam Knees.
			With One Row of Pillars.	With Two Rows of Pillars.	With Three Rows of Pillars.		With One Row of Pillars.	With Two Rows of Pillars.	With Three Rows of Pillars.	
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
20	42	ANGLES ^								
22	42									
24	43		$5\frac{1}{2}\times3\times\cdot34$	$5\times3\times\cdot32$	$4\frac{1}{2}\times3\times\cdot32$	·30				
26	44		$6\times3\times\cdot36$	$5\frac{1}{2}\times3\times\cdot32$	$5\times3\times\cdot32$	·30	$4\frac{1}{2}\times3\times\cdot32$	$4\times3\times\cdot32$	$4\times3\times\cdot30$	·30
28	44		$6\times3\times\cdot40$	$5\frac{1}{2}\times3\times\cdot34$	$5\times3\times\cdot34$	·32	$5\times3\times\cdot32$	$4\frac{1}{2}\times3\times\cdot32$	$4\times3\times\cdot32$	·30
30	45	v	$6\frac{1}{2}\times3\times\cdot36$	$6\times3\times\cdot34$	$5\frac{1}{2}\times3\times\cdot32$	·34	$5\frac{1}{2}\times3\times\cdot34$	$5\times3\times\cdot32$	$4\frac{1}{2}\times3\times\cdot32$	·32
32	45	^	$5\frac{1}{2}\times3\times\cdot34$	$6\times3\times\cdot38$	$5\frac{1}{2}\times3\times\cdot36$	·36	$6\times3\times\cdot34$	$5\frac{1}{2}\times3\times\cdot32$	$4\frac{1}{2}\times3\times\cdot34$	·32
34	46		$6\times3\times\cdot34$	$6\frac{1}{2}\times3\times\cdot34$	$6\times3\times\cdot36$	·36	$6\frac{1}{2}\times3\times\cdot34$	$5\frac{1}{2}\times3\times\cdot36$	$5\times3\times\cdot34$	·34
36	47		$6\frac{1}{2}\times3\times\cdot38$	$5\frac{1}{2}\times3\times\cdot34$	$6\frac{1}{2}\times3\times\cdot36$	·38	$5\frac{1}{2}\times3\times\cdot34$	$6\times3\times\cdot36$	$5\times3\times\cdot36$	·34
38	48		$7\frac{1}{2}\times3\times\cdot36$	$6\times3\times\cdot34$	$5\frac{1}{2}\times3\times\cdot34$	·38	$6\times3\times\cdot34$	$6\times3\times\cdot40$	$5\frac{1}{2}\times3\times\cdot36$	·36
40	49		$8\times3\times\cdot42$	$6\frac{1}{2}\times3\times\cdot34$	$6\times3\times\cdot34$	·40	$6\frac{1}{2}\times3\times\cdot38$	$5\frac{1}{2}\times3\times\cdot34$	$5\frac{1}{2}\times3\times\cdot38$	·38
42	50		$8\frac{1}{2}\times3\times\cdot46$	$7\times3\times\cdot36$	$6\frac{1}{2}\times3\times\cdot36$	·42	$7\frac{1}{2}\times3\times\cdot36$	$6\times3\times\cdot34$	$6\times3\times\cdot38$	·38
44	51	BULB ANGLES	$9\times3\times\cdot52$	$7\frac{1}{2}\times3\times\cdot40$	$7\times3\times\cdot36$	·44	$8\times3\times\cdot40$	$6\frac{1}{2}\times3\times\cdot34$	$5\frac{1}{2}\times3\times\cdot34$	·40
46	52		$10\times3\frac{1}{2}\times\cdot48$	$8\times3\times\cdot42$	$7\frac{1}{2}\times3\times\cdot38$	·46	$8\frac{1}{2}\times3\times\cdot42$	$7\times3\times\cdot34$	$6\times3\times\cdot34$	·42
48	54		$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$8\frac{1}{2}\times3\times\cdot44$	$8\times3\times\cdot40$	·48	$9\times3\times\cdot44$	$7\frac{1}{2}\times3\times\cdot36$	$6\times3\times\cdot40$	·44
50	56		$11\times3\frac{1}{2}\times\cdot56$	$9\times3\frac{1}{2}\times\cdot46$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	·50	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$8\times3\times\cdot38$	$6\frac{1}{2}\times3\times\cdot38$	·46
52	57		$12\times3\frac{1}{2}\times\cdot54$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$9\times3\frac{1}{2}\times\cdot44$	·52	$10\times3\frac{1}{2}\times\cdot50$	$8\frac{1}{2}\times3\times\cdot42$	$7\frac{1}{2}\times3\times\cdot36$	·48
54	58			$10\times3\frac{1}{2}\times\cdot50$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	·52	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot54$	$8\frac{1}{2}\times3\times\cdot48$	$7\frac{1}{2}\times3\times\cdot40$	·50
56	59			$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$10\times3\frac{1}{2}\times\cdot50$	·54	$11\times3\frac{1}{2}\times\cdot60$	$9\times3\times\cdot52$	$8\times3\times\cdot38$	·52
58	60	v		$11\times3\frac{1}{2}\times\cdot54$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	·54	$12\times3\frac{1}{2}\times\cdot52$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$8\frac{1}{2}\times3\times\cdot40$	·52

BEAMS fitted to ALTERNATE FRAMES.

TABLE 13 *(Concluded.)*

BREADTH OF DECK AMIDSHIPS.	SPACING OF BEAMS.		BEAMS AT ALL DECKS ON WHICH CARGO IS CARRIED.			
			SIZE OF BEAMS AMIDSHIPS.			Thickness of Beam Knees.
			With One Row of Pillars.	With Two Rows of Pillars.	With Three Rows of Pillars.	
Feet.	Inches.		Inches.	Inches.	Inches.	Inches.
20	42	ANGLES				
22	42					
24	43					
26	44	BULB ANGLES	$5\frac{1}{2}\times3\times\cdot34$ 5·96	6 ×3 ×·36 4·31	5 ×3 ×·32 2·40	·34
28	44		6 ×3 ×·36 7·30	$6\frac{1}{2}\times3\times\cdot36$ 5·0	5 ×3 ×·34 2·86	·36
30	45		$6\frac{1}{2}\times3\times\cdot38$ 8·75	$5\frac{1}{2}\times3\times\cdot34$ 5·96	$5\frac{1}{2}\times3\times\cdot32$ 3·26	·38
32	45		$7\frac{1}{2}\times3\times\cdot36$ 11·80	6 ×3 ×·36 7·30	$5\frac{1}{2}\times3\times\cdot36$ 3·63	·40
34	46		8 ×3 ×·42 14·45	$6\frac{1}{2}\times3\times\cdot36$ 8·56	6 ×3 ×·36 4·31	·42
36	47		$8\frac{1}{2}\times3\times\cdot48$ 17·35	7 ×3 ×·36 10·10	$6\frac{1}{2}\times3\times\cdot36$ 5·00	·44
38	48		$9\frac{1}{2}\times3\frac{1}{2}\times\cdot44$ 21·35	$7\frac{1}{2}\times3\times\cdot36$ 11·80	$5\frac{1}{2}\times3\times\cdot34$ 5·95	·46
40	49		10 ×3½×·48 24·85	8 ×3 ×·38 13·85	6 ×3 ×·34 7·15	·48
42	50		$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 29·00	8 ×3 ×·46 15·00	$6\frac{1}{2}\times3\times\cdot36$ 8·55	·50
44	51		11 ×3½×·56 32·90	$8\frac{1}{2}\times3\times\cdot48$ 17·35	7 ×3 ×·36 10·10	·50
46	52		12 ×3½×·52 38·30	9 ×3 ×·52 20·85	$7\frac{1}{2}\times3\times\cdot38$ 12·05	·52
48	54		43·7	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 23·20	8 ×3 ×·40 14·15	·52
50	56		50	10 ×3½×·52 25·90	$8\frac{1}{2}\times3\times\cdot42$ 16·45	·54
52	57		57	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$ 29·10	9 ×3 ×·44 19·20	·54
54	58		63·5	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot60$ 31·0	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot46$ 21·85	·56
56	59		71·5	11 ×3½×·60 33·90	10×3½×·50 23·35	·56
58	60		79	12 ×3½×·52 39·30	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 29·50	·56

DIAMETERS of SOLID IRON or STEEL PILLARS FITTED TWO FRAME SPACES APART.

TABLE 14

(See Continuation.)

LENGTH OF PILLAR.	ONE ROW OF PILLARS.													TWO ROWS OF PILLARS.											
	To Beams of Upper Deck.							To Beams of Second Deck.						To Beams of Upper Deck.				To Beams of Second Deck.				To Beams of Third Deck.			
	Length of Beam Amidships in feet.													Length of Beam Amidships in feet.											
	20	26	32	38	44	50	56	26	32	38	44	50	56	50	56	62	68	50	56	62	68	50	56	62	68
Feet.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
8	2¼	2⅜	2½	2⅝	2¾	2⅞	3	3	3⅛	3¼	3⅜	3½	3⅝	2⅝	2¾	2⅞	3	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛
10	2⅜	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	2¾	2⅞	3	3⅛	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜
12	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3½	3⅝	3¾	3⅞	4	4⅛	2⅞	3	3⅛	3¼	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝
14	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	4	4¼	4⅜	4½	3⅛	3¼	3⅜	3½	4	4¼	4⅜	4½	4½	4¾	4⅞	5
16	3	3⅛	3¼	3⅜	3½	3⅝	3¾		4	4¼	4½	4¾	4⅞	3⅜	3½	3⅝	3¾	4¼	4½	4¾	4⅞	4¾	5	5¼	5⅜
18		3⅜	3½	3⅝	3¾	3⅞	4			4½	4¾	5	5¼	3⅝	3¾	3⅞	4	4½	4¾	5	5¼	5	5¼	5½	5¾
20		3⅝	3¾	3⅞	4	4⅛	4¼				5	5¼	5½	3⅞	4	4⅛	4¼	4¾	5	5¼	5½	5¼	5½	5¾	6
22		3⅞	4	4⅛	4¼	4⅜	4½					5½	5¾	4⅛	4¼	4⅜	4½	5	5¼	5½	5¾	5½	5¾	6	6¼
24		4⅛	4¼	4⅜	4½	4⅝	4¾				5½	5¾	6	4⅜	4½	4⅝	4¾	5¼	5½	5¾	6	5¾	6	6¼	6½
26			4½	4⅝	4¾	4⅞	5					6	6¼	4⅝	4¾	4⅞	5	5½	5¾	6	6¼		6¼	6½	6¾
28				4⅞	5	5⅛	5¼					6¼	6½	4⅞	5	5⅛	5¼	5¾	6	6¼	6½			6¾	7
30				5⅛	5¼	5⅜	5½			6	6¼	6½	6¾	5⅛	5¼	5⅜	5½	6	6¼	6½	6¾				
32				5⅜	5½	5⅝	5¾			6¼	6½	6¾	7	5⅜	5½	5⅝	5¾	6¼	6½	6¾	7				

The pillars to beams of detached Superstructure decks may be ⅛ inch less in diameter than those required by above Table for beams to Upper decks.

DOUBLE ANGLE GIRDERS at HEADS of CLOSELY SPACED PILLARS.

FRAME SPACING.	SIZE OF ANGLES IN INCHES.
Inches.	
23	3 × 3 × ·30
27	3½ × 3½ × ·38
31	4 × 4 × ·46
35	4 × 4 × ·54

DIAMETERS of SOLID IRON or STEEL PILLARS FITTED TWO FRAME SPACES APART.

TABLE 14
(Concluded.)

LENGTH OF PILLAR.	TWO ROWS OF PILLARS.				THREE ROWS OF PILLARS.																			
	To Beams of Fourth Deck.				To Beams of Upper Deck.				To Beams of Second Deck.				To Beams of Third Deck.				To Beams of Fourth Deck.				To Beams of Fifth Deck.			
	Length of Beam Amidships in feet.				Length of Beam Amidships in feet.																			
	50	56	62	68	62	68	74	80	62	68	74	80	62	68	74	80	62	68	74	80	62	68	74	80
Feet	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
8	$4\frac{1}{8}$	$4\frac{1}{4}$	$4\frac{3}{8}$	$4\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{7}{8}$	3	$3\frac{1}{4}$	$3\frac{3}{8}$	$3\frac{1}{2}$	$3\frac{5}{8}$	$3\frac{3}{4}$	$3\frac{7}{8}$	4	$4\frac{1}{8}$	$4\frac{1}{8}$	$4\frac{1}{4}$	$4\frac{3}{8}$	$4\frac{1}{2}$	$4\frac{3}{8}$	$4\frac{1}{2}$	$4\frac{5}{8}$	$4\frac{3}{4}$
10	$4\frac{3}{8}$	$4\frac{1}{2}$	$4\frac{5}{8}$	$4\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{7}{8}$	3	$3\frac{1}{8}$	$3\frac{1}{2}$	$3\frac{5}{8}$	$3\frac{3}{4}$	$3\frac{7}{8}$	4	$4\frac{1}{8}$	$4\frac{1}{4}$	$4\frac{3}{8}$	$4\frac{3}{8}$	$4\frac{1}{2}$	$4\frac{5}{8}$	$4\frac{3}{4}$	$4\frac{5}{8}$	$4\frac{3}{4}$	$4\frac{7}{8}$	5
12	$4\frac{5}{8}$	$4\frac{3}{4}$	$4\frac{7}{8}$	$5\frac{1}{8}$	$2\frac{7}{8}$	3	$3\frac{1}{8}$	$3\frac{1}{4}$	$3\frac{3}{4}$	$3\frac{7}{8}$	4	$4\frac{1}{8}$	$4\frac{1}{4}$	$4\frac{3}{8}$	$4\frac{1}{2}$	$4\frac{5}{8}$	$4\frac{5}{8}$	$4\frac{3}{4}$	$4\frac{7}{8}$	$5\frac{1}{8}$	$4\frac{7}{8}$	5	$5\frac{1}{8}$	$5\frac{3}{8}$
14	$4\frac{7}{8}$	$5\frac{1}{8}$	$5\frac{1}{4}$	$5\frac{3}{8}$	$3\frac{1}{8}$	$3\frac{1}{4}$	$3\frac{3}{8}$	$3\frac{1}{2}$	4	$4\frac{1}{4}$	$4\frac{3}{8}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{3}{4}$	$4\frac{7}{8}$	5	$4\frac{7}{8}$	$5\frac{1}{8}$	$5\frac{1}{4}$	$5\frac{3}{8}$	$5\frac{1}{8}$	$5\frac{3}{8}$	$5\frac{1}{2}$	$5\frac{5}{8}$
16	$5\frac{1}{8}$	$5\frac{3}{8}$	$5\frac{5}{8}$	$5\frac{3}{4}$					$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	5	$4\frac{3}{4}$	5	$5\frac{1}{4}$	$5\frac{3}{8}$	$5\frac{1}{8}$	$5\frac{3}{8}$	$5\frac{5}{8}$	$5\frac{3}{4}$	$5\frac{3}{8}$	$5\frac{5}{8}$	$5\frac{7}{8}$	6
18	$5\frac{3}{8}$	$5\frac{5}{8}$	$5\frac{7}{8}$	$6\frac{1}{8}$					$4\frac{1}{2}$	$4\frac{3}{4}$	5		5	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{3}{4}$	$5\frac{3}{8}$	$5\frac{5}{8}$	$5\frac{7}{8}$	$6\frac{1}{8}$	$5\frac{5}{8}$	$5\frac{7}{8}$	$6\frac{1}{8}$	$6\frac{3}{8}$
20	$5\frac{5}{8}$	$5\frac{7}{8}$	$6\frac{1}{8}$	$6\frac{3}{8}$					$4\frac{3}{4}$	5			$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{3}{4}$	6	$5\frac{5}{8}$	$5\frac{7}{8}$	$6\frac{1}{8}$	$6\frac{3}{8}$	$5\frac{7}{8}$	$6\frac{1}{8}$	$6\frac{3}{8}$	$6\frac{5}{8}$
22	$5\frac{7}{8}$	$6\frac{1}{8}$	$6\frac{3}{8}$	$6\frac{5}{8}$					5	$5\frac{1}{4}$			$5\frac{1}{2}$	$5\frac{3}{4}$	6	$6\frac{1}{4}$	$5\frac{7}{8}$	$6\frac{1}{8}$	$6\frac{3}{8}$	$6\frac{5}{8}$	$6\frac{1}{8}$	$6\frac{3}{8}$	$6\frac{5}{8}$	$6\frac{7}{8}$
24	$6\frac{1}{8}$	$6\frac{3}{8}$	$6\frac{5}{8}$	$6\frac{7}{8}$					$5\frac{1}{4}$	$5\frac{1}{2}$			$5\frac{3}{4}$	6	$6\frac{1}{4}$	$6\frac{1}{2}$	$6\frac{1}{8}$	$6\frac{3}{8}$	$6\frac{5}{8}$	$6\frac{7}{8}$	$6\frac{3}{8}$	$6\frac{5}{8}$	$6\frac{7}{8}$	
26									$5\frac{1}{2}$				6	$6\frac{1}{4}$	$6\frac{1}{2}$	$6\frac{3}{4}$								
28									$5\frac{3}{4}$				$6\frac{1}{4}$	$6\frac{1}{2}$	$6\frac{3}{4}$	7								
30									6				$6\frac{1}{2}$	$6\frac{3}{4}$	7									
32													$6\frac{3}{4}$	7										

The pillars to beams of detached Superstructure decks may be $\frac{1}{8}$ inch less in diameter than those required by above Table for beams to Upper decks.

EQUIVALENT PILLARS of IRON and STEEL.

Solid Pillars as per Table. Diameter....	Inches. $2\frac{1}{8}$	Inches. $2\frac{1}{4}$	Inches. $2\frac{3}{8}$	Inches. $2\frac{1}{2}$	Inches. $2\frac{5}{8}$	Inches. $2\frac{3}{4}$	Inches. $2\frac{7}{8}$	Inches. 3	Inches. $3\frac{1}{8}$	Inches. $3\frac{1}{4}$	Inches. $3\frac{3}{8}$	Inches. $3\frac{1}{2}$	Inches. $3\frac{5}{8}$
Equivalent Hollow Pillars. Diameter and Thickness.....	$2\frac{1}{2} \times \frac{5}{16}$	$2\frac{3}{4} \times \frac{5}{16}$	$3 \times \frac{5}{16}$	$3 \times \frac{6}{16}$	$3\frac{1}{4} \times \frac{6}{16}$	$3\frac{1}{2} \times \frac{6}{16}$	$3\frac{3}{4} \times \frac{6}{16}$	$4 \times \frac{7}{16}$	$4\frac{1}{4} \times \frac{7}{16}$	$4\frac{1}{2} \times \frac{7}{16}$	$4\frac{3}{4} \times \frac{7}{16}$	$5 \times \frac{7}{16}$	$5\frac{1}{2} \times \frac{7}{16}$

Solid Pillars as per Table. Diameter....	Inches. $3\frac{3}{4}$	Inches. $3\frac{7}{8}$	Inches. 4	Inches. $4\frac{1}{4}$	Inches. $4\frac{1}{2}$	Inches. $4\frac{3}{4}$	Inches. 5	Inches. $5\frac{1}{4}$	Inches. $5\frac{1}{2}$	Inches. $5\frac{3}{4}$	Inches. 6	Inches. $6\frac{1}{4}$	Inches. $6\frac{1}{2}$	Inches. $6\frac{3}{4}$
Equivalent Hollow Pillars. Diameter and Thickness.....	$5\frac{3}{4} \times \frac{8}{16}$	$6 \times \frac{8}{16}$	$6 \times \frac{9}{16}$	$6\frac{1}{4} \times \frac{9}{16}$	$6\frac{1}{2} \times \frac{9}{16}$	$6\frac{3}{4} \times \frac{9}{16}$	$7 \times \frac{9}{16}$	$7 \times \frac{10}{16}$	$7\frac{1}{2} \times \frac{10}{16}$	$7\frac{3}{4} \times \frac{10}{16}$	$8\frac{1}{2} \times \frac{10}{16}$	$8\frac{1}{2} \times \frac{11}{16}$	$8\frac{3}{4} \times \frac{11}{16}$	$9 \times \frac{11}{16}$

The Hollow Pillars required by the above Table are to have Solid Welded Heads and Heels.

WIDELY SPACED STEEL PILLARS.

TABLE 15

(See Continuation.)

VALUES OF $\frac{S \times B \times H}{100}$	LENGTH AND FORM OF PILLAR.							
	Feet. 8				Feet. 10			
	Tubular.	Double Channels and Face Plates.		Four Angles.	Tubular.	Double Channels and Face Plates.		Four Angles.
	Outside Diameter.	Channels.	Plates.		Outside Diameter.	Channels.	Plates.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
13	6 ×·36	6 ×3 ×3 ×·36			6 ×·38	6 ×3 ×3 ×·38		
16	6 ×·40	6 ×3 ×3 ×·40			6½ ×·40	6 ×3½ ×3½ ×·40		
19	6½ ×·40	6 ×3½ ×3½ ×·40			7 ×·40	7 ×3½ ×3½ ×·40		
22	7 ×·40	7 ×3½ ×3½ ×·40			7½ ×·40	7 ×3½ ×3½ ×·44		4 ×4 ×·40
25	7½ ×·40	7 ×3½ ×3½ ×·44			8 ×·40	7½ ×3½ ×3½ ×·44		4 ×4 ×·42
29	8 ×·40	7½ ×3½ ×3½ ×·44		4 ×4 ×·40	8 ×·44	7½ ×3½ ×3½ ×·50		4 ×4 ×·44
33	9 ×·40	8 ×3½ ×3½ ×·46		4½ ×4½ ×·40	9 ×·42	8 ×3½ ×3½ ×·48		4½ ×4½ ×·42
37	10 ×·40	8 ×4 ×4 ×·46		5 ×5 ×·40	10 ×·42	8 ×4 ×4 ×·48		5 ×5 ×·42
42	10 ×·44	8 ×4 ×4 ×·52		5 ×5 ×·44	10 ×·46	8 ×4 ×4 ×·54		5 ×5 ×·46
47	11 ×·44	9 ×4 ×4 ×·50		5 ×5 ×·48	11 ×·48	9 ×4 ×4 ×·56		5 ×5 ×·50
52	11 ×·50	9 ×4 ×4 ×·56		5 ×5 ×·52	12 ×·46	9 ×4 ×4 ×·60		5 ×5 ×·54
58	12 ×·48	9 ×4 ×4 ×·62		5 ×5 ×·58	12 ×·50	8½ ×3½ ×3½ ×·44	10 ×·40	5 ×5 ×·60
64	13 ×·50	9½ ×3½ ×3½ ×·44	10 ×·42	6 ×6 ×·50	13 ×·50	9½ ×3½ ×3½ ×·44	11 ×·42	6 ×6 ×·50
71	13 ×·54	10 ×3½ ×3½ ×·44	11 ×·42	6 ×6 ×·54	13 ×·56	10 ×3½ ×3½ ×·46	11 ×·44	6 ×6 ×·54
78	14 ×·54	11 ×3½ ×3½ ×·44	11 ×·46	6 ×6 ×·60	14 ×·56	11 ×3½ ×3½ ×·46	11 ×·46	6 ×6 ×·60
86	15 ×·54	11 ×3½ ×3½ ×·46	12 ×·50	6 ×6 ×·64	15 ×·56	11 ×3½ ×3½ ×·48	12 ×·50	6 ×6 ×·64
94	16 ×·54	11 ×3½ ×3½ ×·50	12 ×·56	6 ×6 ×·70	16 ×·56	11 ×3½ ×3½ ×·52	12 ×·56	6 ×6 ×·70
102	17 ×·56	11 ×3½ ×3½ ×·50	12 ×·60	7 ×7 ×·60	17 ×·58	11 ×3½ ×3½ ×·52	12 ×·60	7 ×7 ×·60
110	17 ×·60	11½ ×3½ ×3½ ×·50	13 ×·60	7 ×7 ×·64	17 ×·64	11½ ×3½ ×3½ ×·52	13 ×·60	7 ×7 ×·64
118	18 ×·60	12 ×3½ ×3½ ×·50	13 ×·70	7 ×7 ×·70	18 ×·64	12 ×3½ ×3½ ×·52	13 ×·70	7 ×7 ×·70
126	18 ×·66	12 ×3½ ×3½ ×·50	13 ×·74	7 ×7 ×·74	18 ×·68	12 ×3½ ×3½ ×·52	13 ×·74	7 ×7 ×·74
134	19 ×·66	F.S=3		7 ×7 ×·80	19 ×·68	F.S=3		7 ×7 ×·80

WIDELY SPACED STEEL PILLARS.

TABLE 15

(See Continuation.)

VALUES OF $\frac{S \times B \times H}{100}$	LENGTH AND FORM OF PILLAR.							
	Feet. 12				Feet. 14			
	Tubular.	Double Channels and Face Plates.		Four Angles.	Tubular.	Double Channels and Face Plates.		Four Angles.
7	Outside Diameter.	Channels.	Plates.		Outside Diameter.	Channels.	Plates.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
13	$6\frac{1}{2} \times \cdot38$	$6 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot38$			$7 \times \cdot38$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot38$		$4 \times 4 \times \cdot40$
16	$7 \times \cdot38$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot38$			$7\frac{1}{2} \times \cdot38$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot42$		$4 \times 4 \times \cdot42$
19	$7\frac{1}{2} \times \cdot40$	$7 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot44$			$8 \times \cdot40$	$7\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot44$		$4 \times 4 \times \cdot44$
22	$8 \times \cdot40$	$7\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot44$		$4 \times 4 \times \cdot44$	$8\frac{1}{2} \times \cdot40$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$		$4\frac{1}{2} \times 4\frac{1}{2} \times \cdot40$
25	$8\frac{1}{2} \times \cdot40$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$		$4\frac{1}{2} \times 4\frac{1}{2} \times \cdot40$	$8\frac{1}{2} \times \cdot42$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$		$4\frac{1}{2} \times 4\frac{1}{2} \times \cdot44$
29	$8\frac{1}{2} \times \cdot44$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$		$4\frac{1}{2} \times 4\frac{1}{2} \times \cdot44$	$9 \times \cdot42$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$		$5 \times 5 \times \cdot40$
33	$9 \times \cdot44$	$8 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$		$5 \times 5 \times \cdot40$	$10 \times \cdot42$	$8 \times 4 \times 4 \times \cdot50$		$5 \times 5 \times \cdot44$
37	$10 \times \cdot44$	$8 \times 4 \times 4 \times \cdot52$		$5 \times 5 \times \cdot44$	$10 \times \cdot48$	$9 \times 4 \times 4 \times \cdot52$		$5 \times 5 \times \cdot50$
42	$10 \times \cdot50$	$9 \times 4 \times 4 \times \cdot54$		$5 \times 5 \times \cdot50$	$11 \times \cdot48$	$8\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot44$	$9 \times \cdot40$	$5 \times 5 \times \cdot54$
47	$11 \times \cdot50$	$9 \times 4 \times 4 \times \cdot60$		$5 \times 5 \times \cdot54$	$12 \times \cdot50$	$9 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot44$	$10 \times \cdot40$	$5 \times 5 \times \cdot60$
52	$12 \times \cdot48$	$8\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot44$	$10 \times \cdot40$	$5 \times 5 \times \cdot60$	$12 \times \cdot54$	$9\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$	$10 \times \cdot42$	$6 \times 6 \times \cdot50$
58	$12 \times \cdot52$	$9\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$	$10 \times \cdot42$	$6 \times 6 \times \cdot50$	$13 \times \cdot52$	$9\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$	$11 \times \cdot42$	$6 \times 6 \times \cdot54$
64	$13 \times \cdot52$	$9\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$	$11 \times \cdot42$	$6 \times 6 \times \cdot54$	$13 \times \cdot56$	$10 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$	$11 \times \cdot44$	$6 \times 6 \times \cdot60$
71	$14 \times \cdot52$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$	$11 \times \cdot46$	$6 \times 6 \times \cdot60$	$14 \times \cdot54$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$	$11 \times \cdot46$	$6 \times 6 \times \cdot64$
78	$14 \times \cdot58$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$	$12 \times \cdot48$	$6 \times 6 \times \cdot64$	$15 \times \cdot54$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$	$12 \times \cdot50$	$6 \times 6 \times \cdot70$
86	$15 \times \cdot60$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot52$	$12 \times \cdot50$	$6 \times 6 \times \cdot70$	$16 \times \cdot56$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot52$	$12 \times \cdot56$	$7 \times 7 \times \cdot60$
94	$16 \times \cdot60$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot52$	$12 \times \cdot60$	$7 \times 7 \times \cdot60$	$17 \times \cdot56$	$11 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot52$	$12 \times \cdot60$	$7 \times 7 \times \cdot64$
102	$17 \times \cdot60$	$11\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$	$13 \times \cdot60$	$7 \times 7 \times \cdot64$	$17 \times \cdot64$	$11\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot52$	$13 \times \cdot64$	$7 \times 7 \times \cdot70$
110	$18 \times \cdot60$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$	$13 \times \cdot70$	$7 \times 7 \times \cdot70$	$18 \times \cdot64$	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot52$	$13 \times \cdot70$	$7 \times 7 \times \cdot74$
118	$18 \times \cdot66$			$8 \times 8 \times \cdot64$	$19 \times \cdot62$			$8 \times 8 \times \cdot70$
126	$19 \times \cdot66$			$8 \times 8 \times \cdot70$	$19 \times \cdot70$			$8 \times 8 \times \cdot74$
134	$19 \times \cdot70$			$8 \times 8 \times \cdot74$	$20 \times \cdot68$			

WIDELY SPACED STEEL PILLARS.

TABLE 15

(See Continuation.)

VALUES OF $\frac{S \times B \times H}{100}$	LENGTH AND FORM OF PILLAR.							
	Feet. 16				Feet. 18			
	Tubular.	Double Channels and Face Plates.		Four Angles.	Tubular.	Double Channels and Face Plates.		Four Angles.
	Outside Diameter.	Channels.	Plates.		Outside Diameter.	Channels.	Plates.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
13	7 ×·40	7 ×3½×3½×·40		4 ×4 ×·42	7½×·40	7 ×3½×3½×·44		4½×4½×·40
16	7½×·40	7 ×3½×3½×·44		4 ×4 ×·44	8 ×·40	7½×3½×3½×·44		4½×4½×·42
19	8 ×·40	7½×3½×3½×·44		4½×4½×·40	8½×·40	8 ×3½×3½×·50		5 ×5 ×·40
22	8½×·40	8 ×3½×3½×·48		4½×4½×·44	9 ×·40	8 ×3½×3½×·52		5 ×5 ×·42
25	9 ×·40	8 ×3½×3½×·50		5 ×5 ×·40	9 ×·44	8 ×3½×3½×·56		5 ×5 ×·44
29	9 ×·44	8 ×3½×3½×·54		5 ×5 ×·44	10 ×·42	8 ×4 ×4 ×·54		5 ×5 ×·50
33	10 ×·44	8 ×4 ×4 ×·54		5 ×5 ×·50	10 ×·46	9 ×4 ×4 ×·52		5 ×5 ×·54
37	10 ×·50	9 ×4 ×4 ×·54		5 ×5 ×·54	11 ×·46	9 ×4 ×4 ×·56		5 ×5 ×·60
42	11 ×·50	8½×3½×3½×·48	10×·40	5 ×5 ×·60	12 ×·48	9 ×3½×3½×·44	10×·42	6 ×6 ×·50
47	12 ×·52	9 ×3½×3½×·48	10×·42	6 ×6 ×·50	12 ×·54	9½×3½×3½×·48	10×·42	6 ×6 ×·54
52	12 ×·54	10 ×3½×3½×·48	11×·42	6 ×6 ×·54	13 ×·50	10 ×3½×3½×·48	11×·46	6 ×6 ×·60
58	13 ×·54	10½×3½×3½×·48	11×·46	6 ×6 ×·60	13 ×·56	11 ×3½×3½×·48	12×·46	6 ×6 ×·64
64	14 ×·54	11 ×3½×3½×·48	12×·50	6 ×6 ×·64	14 ×·56	11 ×3½×3½×·50	12×·52	6 ×6 ×·68
71	14 ×·58	11 ×3½×3½×·50	12×·56	6 ×6 ×·70	15 ×·56	11 ×3½×3½×·50	12×·60	7 ×7 ×·60
78	15 ×·58	11 ×3½×3½×·50	12×·60	7 ×7 ×·60	16 ×·56	11 ×3½×3½×·50	13×·56	7 ×7 ×·64
86	16 ×·60	11 ×3½×3½×·52	13×·60	7 ×7 ×·64	17 ×·56	11½×3½×3½×·50	13×·60	7 ×7 ×·70
94	17 ×·60	11½×3½×3½×·52	13×·66	7 ×7 ×·70	17 ×·62	12 ×3½×3½×·50	13×·64	7 ×7 ×·74
102	18 ×·60	12 ×3½×3½×·52	13×·70	7 ×7 ×·74	18 ×·62			7 ×7 ×·80
110	19 ×·60			7 ×7 ×·80	19 ×·62			7 ×7 ×·84
118	19 ×·66			8 ×8 ×·74	19. ×·68			8 ×8 ×·80
126	20 ×·66			8 ×8 ×·80	20 ×·68			
134					21 ×·68			

WIDELY SPACED STEEL PILLARS.

TABLE 15

(See Continuation.)

VALUES OF $\frac{S \times B \times H}{100}$	LENGTH AND FORM OF PILLAR.							
	Feet. 20				Feet. 22			
	Tubular.	Double Channels and Face Plates.		Four Angles.	Tubular.	Double Channels and Face Plates.		Four Angles.
	Outside Diameter.	Channels.	Plates.		Outside Diameter.	Channels.	Plates.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
13	8 ×·40	$7\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$		$4\frac{1}{2} \times 4\frac{1}{2} \times \cdot 42$	$8\frac{1}{2} \times \cdot 40$	8 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$		$4\frac{1}{2} \times 4\frac{1}{2} \times \cdot 44$
16	$8\frac{1}{2} \times \cdot 40$	8 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$		$4\frac{1}{2} \times 4\frac{1}{2} \times \cdot 44$	9 ×·40	8 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$		5 ×5 ×·42
19	9 ×·40	8 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$		5 ×5 ×·42	9 ×·44	8 ×4 ×4 ×·54		5 ×5 ×·44
22	9 ×·44	8 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$		5 ×5 ×·44	10 ×·40	8 ×4 ×4 ×·58		5 ×5 ×·50
25	10 ×·40	8 ×4 ×4 ×·56		5 ×5 ×·50	10 ×·42	9 ×4 ×4 ×·52		5 ×5 ×·54
29	10 ×·44	9 ×4 ×4 ×·52		5 ×5 ×·54	10 ×·46	9 ×4 ×4 ×·56		5 ×5 ×·56
33	10 ×·48	9 ×4 ×4 ×·56		5 ×5 ×·58	10 ×·50	9 ×4 ×4 ×·60		5 ×5 ×·60
37	11 ×·48	$8\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	10×·40	6 ×6 ×·50	11 ×·50	$8\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	10×·42	6 ×6 ×·52
42	12 ×·50	9 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	10×·42	6 ×6 ×·54	12 ×·52	9 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	11×·42	6 ×6 ×·56
47	13 ×·50	10 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	11×·46	6 ×6 ×·58	13 ×·52	$10\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	11×·46	6 ×6 ×·60
52	13 ×·52	10 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	12×·50	6 ×6 ×·62	13 ×·54	$10\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	12×·50	6 ×6 ×·64
58	14 ×·52	11 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	12×·52	6 ×6 ×·68	14 ×·54	11 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	12×·56	6 ×6 ×·70
64	14 ×·58	11 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	12×·60	6 ×6 ×·70	15 ×·52	11 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	12×·60	7 ×7 ×·60
71	15 ×·58	11 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	13×·60	7 ×7 ×·62	15 ×·60	11 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	13×·60	7 ×7 ×·64
78	16 ×·58	11 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	13×·68	7 ×7 ×·68	16 ×·60	11 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	13×·70	7 ×7 ×·70
86	17 ×·58	$11\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	13×·72	7 ×7 ×·72	17 ×·60	$11\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	13×·72	7 ×7 ×·74
94	18 ×·58	12 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	13×·74	7 ×7 ×·78	18 ×·60	12 $\times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	13×·74	7 ×7 ×·80
102	18 ×·64	12 ×4 ×4 ×·56	13×·74	7 ×7 ×·82	19 ×·60	12 ×4 ×4 ×·60	13×·74	7 ×7 ×·84
110	19 ×·64	12 ×4 ×4 ×·66	14×·74	8 ×8 ×·78	19 ×·66	12 ×4 ×4 ×·68	14×·76	8 ×8 ×·80
118	20 ×·64			8 ×8 ×·82	20 ×·66			8 ×8 ×·82
126	20 ×·70				21 ×·66			
134	21 ×·70				22 ×·66			

WIDELY SPACED STEEL PILLARS.

TABLE 15

(See Continuation.)

VALUES OF $\frac{S \times B \times H}{100}$	LENGTH AND FORM OF PILLAR.							
	Feet. 24				Feet. 26			
	Tubular.	Double Channels and Face Plates.		Four Angles.	Tubular.	Double Channels and Face Plates.		Four Angles.
	Outside Diameter.	Channels.	Plates.		Outside Diameter.	Channels.	Plates.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
13	9×·40	8 ×4 ×4 ×·54		5×5×·44	9×·44	8 ×4 ×4 ×·56		5×5×·50
16	9×·44	8 ×4 ×4 ×·56		5×5×·44	10×·40	9 ×4 ×4 ×·52		5×5×·50
19	10×·40	9 ×4 ×4 ×·50		5×5×·50	10×·44	9 ×4 ×4 ×·56		5×5×·54
22	10×·42	9 ×4 ×4 ×·52		5×5×·52	10×·46	9 ×4 ×4 ×·58		5×5×·54
25	10×·44	9 ×4 ×4 ×·56		5×5×·54	10×·48	9 ×4 ×4 ×·60		5×5×·60
29	10×·48	9 ×4 ×4 ×·60		5×5×·60	10×·50	$8\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	10×·42	6×6×·50
33	11×·48	$8\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	10×·42	6×6×·50	11×·50	9 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	11×·42	6×6×·54
37	12×·48	9 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	11×·42	6×6×·54	12×·50	$9\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	11×·46	6×6×·58
42	12×·54	10 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	11×·44	6×6×·60	13×·50	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	11×·50	6×6×·62
47	13×·54	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	12×·50	6×6×·64	13×·56	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	12×·52	6×6×·66
52	13×·58	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	12×·56	6×6×·68	14×·52	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	12×·56	6×6×·70
58	14×·58	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	12×·60	6×6×·70	15×·52	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	12×·60	7×7×·60
64	15×·56	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	13×·60	7×7×·62	15×·60	$11\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	13×·60	7×7×·64
71	16×·56	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	13×·70	7×7×·68	16×·60	$11\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	13×·70	7×7×·70
78	17×·56	$11\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	13×·74	7×7×·72	17×·60	12 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	13×·74	7×7×·74
86	17×·64	12 $\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot54$	13×·74	7×7×·78	18×·60	12 ×4 ×4 ×·60	13×·74	7×7×·80
94	18×·64	12 ×4 ×4 ×·56	13×·74	7×7×·82	18×·66	12 ×4 ×4 ×·66	13×·74	7×7×·84
102	19×·64	12 ×4 ×4 ×·68	14×·76	7×7×·84	19×·66	12 ×4 ×4 ×·72	14×·76	8×8×·80
110	19×·68			8×8×·80	20×·66			
118	20×·68			8×8×·84	21×·66			
126	21×·68				22×·66			
134	22×·68				22×·70			

WIDELY SPACED STEEL PILLARS. TABLE 15 (Concluded.)

VALUES OF $\frac{S \times B \times H}{100}$	LENGTH AND FORM OF PILLAR.							
	Feet. 28				Feet. 30			
	Tubular.	Double Channels and Face Plates.		Four Angles.	Tubular.	Double Channels and Face Plates.		Four Angles.
	Outside Diameter.	Channels.	Plates.		Outside Diameter.	Channels.	Plates.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
13	10×·42	9 ×4 ×4 ×·52		5×5×·54	10×·48	9 ×4 ×4 ×·60		6×6×·50
16	10×·44	9 ×4 ×4 ×·56		5×5×·54	10×·50	$8\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times$·48	10×·42	6×6×·50
19	10×·48	9 ×4 ×4 ×·60		5×5×·60	11×·44	9 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·46	11×·42	6×6×·54
22	10×·48	$8\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times$·48	10×·40	6×6×·50	11×·44	9 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·46	11×·44	6×6×·54
25	11×·44	9 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·46	11×·42	6×6×·52	11×·48	9 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·48	11×·46	6×6×·58
29	11×·48	9 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·48	11×·44	6×6×·54	11×·50	9 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·48	11×·46	6×6×·60
33	12×·48	$9\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times$·48	11×·46	6×6×·58	12×·50	$9\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times$·48	12×·50	6×6×·62
37	12×·52	10 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·50	11×·46	6×6×·60	12×·54	10 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·48	12×·50	6×6×·64
42	13×·52	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·48	12×·50	6×6×·64	13×·54	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·48	12×·56	6×6×·68
47	14×·52	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·50	12×·56	6×6×·70	14×·54	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·50	12×·60	7×7×·60
52	14×·56	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·50	12×·62	7×7×·60	14×·60	$11\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times$·50	13×·60	7×7×·64
58	15×·56	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·50	13×·64	7×7×·64	15×·60	12 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·50	13×·66	7×7×·70
64	16×·56	11 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·52	13×·70	7×7×·70	16×·60	12 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·50	13×·70	7×7×·74
71	16×·62	$11\frac{1}{2}\times3\frac{1}{2}\times3\frac{1}{2}\times$·50	13×·74	7×7×·74	17×·60	12 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·54	13×·74	7×7×·78
78	17×·62	12 $\times3\frac{1}{2}\times3\frac{1}{2}\times$·54	13×·74	7×7×·78	18×·60	12 ×4 ×4 ×·60	13×·74	8×8×·74
86	18×·62				18×·66			
94	19×·62				19×·66			
102	19×·68				20×·66			
110	20×·68				20×·70			
118	21×·68				21×·70			
126	22×·68				22×·70			
134								

Nominal ∠ 2: Load in Tons

TABLE 15A

WIDELY SPACED SOLID PILLARS in 'TWEEN DECKS.

VALUES OF $\frac{S \times B \times H}{100}$	LENGTH OF PILLAR.			
	8 Feet.		10 Feet.	
	Diameter.	Number of $\frac{7}{8}$ in. rivets in heads and heels.	Diameter.	Number of $\frac{7}{8}$ in. rivets in heads and heels.
	Inches.		Inches.	
7	3	4	$3\frac{1}{4}$	4
9	$3\frac{1}{4}$	4	$3\frac{1}{2}$	4
11	$3\frac{1}{2}$	4	$3\frac{3}{4}$	4
13	$3\frac{3}{4}$	4	4	4
16	4	4	$4\frac{1}{4}$	5
19	$4\frac{1}{4}$	5	$4\frac{1}{2}$	5
22	$4\frac{1}{2}$	5	$4\frac{3}{4}$	5
25	$4\frac{3}{4}$	5	5	6
29	5	6	$5\frac{1}{4}$	6
33	$5\frac{1}{4}$	6	$5\frac{1}{2}$	7
37	$5\frac{1}{2}$	7	$5\frac{3}{4}$	7
42	$5\frac{3}{4}$	7	6	8
47	6	8	$6\frac{1}{4}$	8
52	$6\frac{1}{4}$	8	$6\frac{1}{2}$	8
58	$6\frac{1}{2}$	8		

DECK GIRDERS at HEADS of WIDELY SPACED PILLARS, CHANNELS or ANGLES.

TABLE 16

(See Continuation.)

VALUES OF $\frac{S^2 \times B \times H}{100}$	Thickness of Intercostal Plate and Angle.	DEPTH OF BEAMS.							
		Inches. 5		Inches. 6		Inches. 7		Inches. 8	
		SIZE AND TYPE OF GIRDER.							
		Double Channels.	Double Angles.	Double Channels.	Double Angles.	Double Channels.	Double Angles.	Double Channels.	Double Angles.
	Inch.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
190	·34		6 ×4 ×·44		6×4 ×·40		6 ×4 ×·36		5 ×4 ×·36
220	·34		6 ×4 ×·50		6×4 ×·44		6 ×4 ×·40		6 ×4 ×·36
260	·34	7 × 3×3 ×·38	6 ×4 ×·54		6×4 ×·50		6 ×4 ×·44		6 ×4 ×·40
300	·40	7 ×3½×3½×·40	6 ×4 ×·64	7 ×3 ×3 ×·38	6×4 ×·54		6 ×4 ×·50		6 ×4 ×·44
350	·40	7½×3½×3½×·42	6½×4½×·60	7 ×3½×3½×·40	6×4 ×·64	7 ×3 ×3 ×·38	6 ×4 ×·54		6 ×4 ×·50
400	·40	8 ×3½×3½×·46	6½×4½×·64	7½×3½×3½×·42	6½×4½×·60	7 ×3½×3½×·40	6 ×4 ×·64	7 ×3 ×3 ×·38	6 ×4 ×·54
460	·40	9 ×3½×3½×·46	6 ×6 ×·64	8 ×3½×3½×·46	6½×4½×·64	7½×3½×3½×·42	6½×4½×·60	7 ×3½×3½×·40	6 ×4 ×·64
520	·44	9 ×3½×3½×·60	6 ×6 ×·74	9 ×3½×3½×·46	6 ×6 ×·64	8 ×3½×3½×·46	6½×4½×·64	7½×3½×3½×·42	6½×4½×·60
580	·44	10 ×3½×3½×·60	7 ×7 ×·70	9 ×3½×3½×·60	6 ×6 ×·74	9 ×3½×3½×·46	6 ×6 ×·64	8 ×3½×3½×·46	6½×4½×·64
650	·44	11 ×3½×3½×·60	7 ×7 ×·80	10 ×3½×3½×·60	7 ×7 ×·70	9 ×3½×3½×·60	6 ×6 ×·74	9 ×3½×3½×·46	6 ×6 ×·64
730	·44			11 ×3½×3½×·60	7 ×7 ×·80	10 ×3½×3½×·60	7 ×7 ×·70	9 ×3½×3½×·60	6 ×6 ×·74
810	·44			12 ×3½×3½×·60		11 ×3½×3½×·60	7 ×7 ×·80	10 ×3½×3½×·60	7 ×7 ×·70
900	·50			12 ×4 ×4 ×·64		12 ×3½×3½×·60	7 ×7 ×·90	11 ×3½×3½×·60	7 ×7 ×·80
990	·50			12 ×3½×3½×·60 Rider Plate 8×·60		12 ×4 ×4 ×·64		12 ×3½×3½×·60	7 ×7 ×·90
1090	·50			12 ×3½×3½×·70 Rider Plate 8×·70		12 ×3½×3½×·60 Rider Plate 8×·60		12 ×4 ×4 ×·64	
1200	·50			12 ×4 ×4 ×·70 Rider Plate 9×·70		12 ×3½×3½×·70 Rider Plate 8×·70		12 ×3½×3½×·60 Rider Plate 8×·60	
1320	·50			12 ×4 ×4 ×·72 Rider Plate 10×·74				12 ×3½×3½×·70 Rider Plate 8×·70	
1450	·50							12 ×4 ×4 ×·70 Rider Plate 9×·70	
1590	·50							12 ×4 ×4 ×·72 Rider Plate 10×·74	
1750	·54							12 ×4 ×4 ×·72 Rider Plate 10×·84	
1920	·54							12 ×4 ×4 ×·76 Rider Plate 11×·84	
2100	·54								
2290	·54								

DECK GIRDERS at HEADS of WIDELY SPACED PILLARS, CHANNELS or ANGLES.

TABLE 16 *(Concluded.)*

VALUES OF $\frac{S^2 \times B \times H}{100}$	Thickness of Intercostal Plate and Angle.	DEPTH OF BEAMS.							
		Inches. 9		Inches. 10		Inches. 11		Inches. 12	
		SIZE AND TYPE OF GIRDER.							
		Double Channels.	Double Angles.	Double Channels.	Double Angles.	Double Channels.	Double Angles.	Double Channels.	Double Angles.
	Inch.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
190	·34		5 ×4 ×·30		4 ×4 ×·30				
220	·34		5 ×4 ×·36		5 ×4 ×·30				
260	·34		6 ×4 ×·36		5 ×4 ×·36				
300	·40		6 ×4 ×·40		6 ×4 ×·36				
350	·40		6 ×4 ×·44		6 ×4 ×·40				
400	·40		6 ×4 ×·50		6 ×4 ×·44		6 ×4 ×·40		
460	·40	7 ×3 × 3×·38	6 ×4 ×·54		6 ×4 ×·50		6 ×4 ×·44		6 ×4 ×·40
520	·44	7 ×3½×3½×·40	6 ×4 ×·64	7 ×3 ×3 ×·38	6 ×4 ×·54		6 ×4 ×·50		6 ×4 ×·44
580	·44	7½×3½×3½×·42	6½×4½×·60	7 ×3½×3½×·40	6 ×4 ×·64	7 ×3 ×3 ×·38	6 ×4 ×·54		6 ×4 ×·50
650	·44	8 ×3½×3½×·46	6½×4½×·64	7½×3½×3½×·42	6½×4½×·60	7 ×3½×3½×·40	6 ×4 ×·64	7 ×3 ×3 ×·38	6 ×4 ×·54
730	·44	9 ×3½×3½×·46	6 ×6 ×·64	8 ×3½×3½×·46	6½×4½×·64	7½×3½×3½×·42	6½×4½×·60	7 ×3½×3½×·40	6 ×4 ×·64
810	·44	9 ×3½×3½×·60	6 ×6 ×·74	9 ×3½×3½×·46	6 ×6 ×·64	8 ×3½×3½×·46	6½×4½×·64	7½×3½×3½×·42	6½×4½×·60
900	·50	10 ×3½×3½×·60	7 ×7 ×·70	9 ×3½×3½×·60	6 ×6 ×·74	9 ×3½×3½×·46	6 ×6 ×·64	8 ×3½×3½×·46	6½×4½×·64
990	·50	11 ×3½×3½×·60	7 ×7 ×·80	10 ×3½×3½×·60	7 ×7 ×·70	9 ×3½×3½×·60	6 ×6 ×·74	9 ×3½×3½×·46	6 ×6 ×·64
1090	·50	12 ×3½×3½×·60	7 ×7 ×·90	11 ×3½×3½×·60	7 ×7 ×·80	10 ×3½×3½×·60	7 ×7 ×·70	9 ×3½×3½×·60	6 ×6 ×·74
1200	·50	12 ×4 ×4 ×·64		12 ×3½×3½×·60	7 ×7 ×·90	11 ×3½×3½×·60	7 ×7 ×·80	10 ×3½×3½×·60	7 ×7 ×·70
1320	·50	12 ×3½×3½×·60 Rider Plate 8×·60		12 ×4 ×4 ×·64		12 ×3½×3½×·60	7 ×7 ×·90	11 ×3½×3½×·60	7 ×7 ×·80
1450	·50	12 ×3½×3½×·70 Rider Plate 8×·70		12 ×3½×3½×·60 Rider Plate 8×·60		12 ×4 ×4 ×·64		12 ×3½×3½×·60	7 ×7 ×·90
1590	·50	12 ×4 ×4 ×·70 Rider Plate 9×·70		12 ×3½×3½×·70 Rider Plate 8×·70		12 ×3½×3½×·60 Rider Plate 8×·60		12 ×4 ×4 ×·64	
1750	·54	12 ×4 ×4 ×·72 Rider Plate 10×·74		12 ×4 ×4 ×·70 Rider Plate 9×·70		12 ×3½×3½×·70 Rider Plate 8×·70		12 ×3½×3½×·60 Rider Plate 8×·60	
1920	·54	12 ×4 ×4 ×·74 Rider Plate 11×·78		12 ×4 ×4 ×·72 Rider Plate 10×·74		12 ×4 ×4 ×·70 Rider Plate 9×·70		12 ×3½×3½×·70 Rider Plate 8×·70	
2100	·54					12 ×4 ×4 ×·72 Rider Plate 11×·74		12 ×4 ×4 ×·72 Rider Plate 10×·70	
2290	·54							12 ×4 ×4 ×·72 Rider Plate 11×·82	

DECK GIRDERS at HEADS of WIDELY SPACED PILLARS, BULB ANGLE FACE BARS.

TABLE 17

(See Continuation.)

VALUES OF $\frac{S^2 \times B \times H}{100}$		DEPTH AND THICKNESS OF GIRDER.								
		Inches. 12 × ·40	Inches. 13 × ·40	Inches. 14 × ·42	Inches. 15 × ·42	Inches. 16 × ·44	Inches. 17 × ·44	Inches. 18 × ·46	Inches. 19 × ·46	Inches. 20 × ·48
190	SINGLE BULB ANGLES	9 × 3 × ·44	8 × 3 × ·42	7 × 3 × ·40	6 × 3 × ·40	5½ × 3 × ·36	5 × 3 × ·34			
220		9 × 3 × ·48	8½ × 3 × ·44	7½ × 3 × ·42	7 × 3 × ·38	6 × 3 × ·38	5½ × 3 × ·34			
260		9 × 3 × ·52	9 × 3 × ·44	7½ × 3 × ·46	7 × 3 × ·42	6½ × 3 × ·40	6 × 3 × ·36			
300		9½ × 3½ × ·52	9½ × 3½ × ·46	8½ × 3 × ·44	7½ × 3 × ·44	7 × 3 × ·42	6 × 3 × ·42	5½ × 3 × ·36		
350		10½ × 3½ × ·54	9½ × 3½ × ·52	9 × 3 × ·48	8½ × 3 × ·44	7½ × 3 × ·44	7 × 3 × ·40	6 × 3 × ·40	5½ × 3 × ·36	
400		11 × 3½ × ·60	10½ × 3½ × ·54	9½ × 3½ × ·52	9 × 3 × ·50	8½ × 3 × ·44	7½ × 3 × ·44	7 × 3 × ·40	6½ × 3 × ·38	5½ × 3 × ·36
460		11½ × 3½ × ·66	11 × 3½ × ·60	10½ × 3½ × ·54	9½ × 3½ × ·52	9 × 3 × ·50	8½ × 3 × ·46	7½ × 3 × ·46	7 × 3 × ·42	6 × 3 × ·42
520		8½ × 3 × ·48	12 × 3½ × ·64	11½ × 3½ × ·56	10½ × 3½ × ·56	9½ × 3½ × ·52	9 × 3 × ·50	9 × 3 × ·46	8 × 3 × ·44	7 × 3 × ·42
580		9 × 3 × ·50	8½ × 3 × ·48	12 × 3½ × ·64	11½ × 3½ × ·58	10½ × 3½ × ·56	9½ × 3½ × ·54	9 × 3 × ·54	9 × 3 × ·46	8 × 3 × ·46
650		9½ × 3½ × ·52	9 × 3 × ·52	8½ × 3 × ·48	12 × 3½ × ·66	11 × 3½ × ·64	10½ × 3½ × ·58	10 × 3½ × ·54	10 × 3½ × ·48	8½ × 3 × ·52
730		10½ × 3½ × ·54	9½ × 3½ × ·54	9 × 3 × ·52	8½ × 3 × ·50	12 × 3½ × ·68	11½ × 3½ × ·62	11 × 3½ × ·58	10 × 3½ × ·58	9½ × 3½ × ·54
810		11 × 3½ × ·62	10½ × 3½ × ·56	9½ × 3½ × ·56	9½ × 3½ × ·50	9 × 3 × ·48	12 × 3½ × ·70	12 × 3½ × ·62	11 × 3½ × ·62	10½ × 3½ × ·58
900		12 × 3½ × ·66	11½ × 3½ × ·62	11 × 3½ × ·54	10½ × 3½ × ·52	9 × 3½ × ·54	9 × 3 × ·50	8½ × 3 × ·48	12 × 3½ × ·66	11½ × 3½ × ·64
990			12 × 3½ × ·70	12 × 3½ × ·60	11 × 3½ × ·60	10 × 3½ × ·58	10 × 3½ × ·52	9 × 3½ × ·52	9 × 3 × ·50	8½ × 3 × ·48
1090				12 × 3½ × ·72	12 × 3½ × ·64	11 × 3½ × ·62	11 × 3½ × ·56	10½ × 3½ × ·52	9½ × 3½ × ·52	9 × 3 × ·54
1200	DOUBLE BULB ANGLES				12 × 3½ × ·74	12 × 3½ × ·66	11½ × 3½ × ·62	11 × 3½ × ·58	10½ × 3½ × ·56	9½ × 3½ × ·56
1320							12 × 3½ × ·68	11½ × 3½ × ·64	11 × 3½ × ·60	11 × 3½ × ·56
1450								12 × 3½ × ·68	11½ × 3½ × ·64	11 × 3½ × ·62
1590								12 × 3½ × ·72	12 × 3½ × ·68	12 × 3½ × ·62
1750									12 × 3½ × ·74	12 × 3½ × ·68
1920										
2100										
2290										
2480										
2690										
2910										
3160										
3460										

DECK GIRDERS at HEADS of WIDELY SPACED PILLARS, BULB ANGLE FACE BARS.

TABLE 17

(See Continuation.)

VALUES OF $\frac{S^2 \times B \times H}{100}$		DEPTH AND THICKNESS OF GIRDER.							
		20	21	22	23	24	25	26	27
		Inches. 21 × ·48	Inches. 22 × ·48	Inches. 23 × ·50	Inches. 24 × ·50	Inches. 25 × ·50	Inches. 26 × ·52	Inches. 27 × ·52	Inches. 28 × ·54
190	SINGLE BULB ANGLES								
220									
260									
300									
350									
400									
460		5½ × 3 × ·36 3·40							
520		6 × 3 × ·42 4·11	5½ × 3 × ·36 3·40						
580		7 × 3 × ·46 5·00	6½ × 3 × ·42 4·36	6 × 3 × ·38 3·81	5½ × 3 × ·34 3·26				
650		8 × 3 × ·48 5·80	7½ × 3 × ·44 5·16	7 × 3 × ·42 4·67	6½ × 3 × ·40 4·20	5½ × 3 × ·36 3·40			
730		9 × 3 × ·52 6·89	8½ × 3 × ·50 6·32	8 × 3 × ·46 5·62	7½ × 3 × ·44 5·16	7 × 3 × ·40 4·80	6 × 3 × ·38 3·81	5½ × 3 × ·34 3·26	
810		10 × 3½ × ·54 8·08	9½ × 3½ × ·50 7·29	9 × 3 × ·50 6·69	8½ × 3 × ·46 5·94	7½ × 3 × ·44 5·16	7 × 3 × ·42 4·67	6½ × 3 × ·38 4·04	5½ × 3 × ·36 3·40
900		11 × 3½ × ·60 9·56	10½ × 3½ × ·56 8·42	9½ × 3½ × ·56 7·93	9½ × 3½ × ·50 7·26	8½ × 3 × ·52 6·81	8 × 3 × ·48 5·8	7½ × 3 × ·44 5·16	6½ × 3 × ·44 4·52
990		12 × 3½ × ·66 11·21	12 × 3½ × ·60 10·2	11 × 3½ × ·58 9·32	10½ × 3½ × ·54 8·48	9½ × 3 × ·56 7·93	9 × 3 × ·54 7·7	9 × 3 × ·48 6·49	8 × 3 × ·48 5·80
1090	DOUBLE BULB ANGLES	9 × 3 × ·50 10·38	8½ × 3 × ·48 12·26	12 × 3½ × ·66	11½ × 3½ × ·62 10·29	11 × 3½ × ·60 9·56	10½ × 3½ × ·56 8·42	10 × 3½ × ·52 7·86	9½ × 3½ × ·50 7·29
1200		9 × 3½ × ·54 14·7	9 × 3 × ·52 12·48	9 × 3 × ·48 13·98	12 × 3½ × ·70 11·43	12 × 3½ × ·64 10·95	11½ × 3½ × ·62 10·29	11 × 3½ × ·58 9·32	10½ × 3½ × ·54 8·48
1320		10½ × 3½ × ·54 14·26	9½ × 3½ × ·54 15·42	9½ × 3½ × ·50 14·56	9 × 3 × ·50 13·38	8½ × 3 × ·50 12·64	12 × 3½ × ·68	11½ × 3½ × ·66 10·49	11 × 3½ × ·62 9·86
1450		11 × 3½ × ·60 19·12	10 × 3½ × ·58 14·06	9½ × 3½ × ·56 15·96	9 × 3½ × ·54 14·7	9 × 3½ × ·52 14·3	9 × 3 × ·48 12·98	12 × 3½ × ·72	12 × 3½ × ·66
1590		11½ × 3½ × ·60 20·08	11 × 3½ × ·58 18·64	10½ × 3½ × ·56 17·44	10 × 3½ × ·54 16·16	10 × 3½ × ·50 15·24	9 × 3½ × ·52 14·3	9 × 3 × ·50 13·38	8½ × 3 × ·48 12·26
1750		12 × 3½ × ·64 21·9	11½ × 3½ × ·62 20·58	11 × 3½ × ·58 18·64	10½ × 3½ × ·56 17·444	10½ × 3½ × ·52 16·8	9½ × 3½ × ·54 15·42	9½ × 3½ × ·50 14·56	9 × 3 × ·52 13·48
1920		12 × 3½ × ·72 23·98	12 × 3½ × ·66 22·42	11½ × 3½ × ·62 20·58	11 × 3½ × ·62 19·16	11 × 3½ × ·58 18·64	10½ × 3½ × ·56 17·44	10½ × 3½ × ·52 16·8	9½ × 3½ × ·56 16·86
2100				12 × 3½ × ·70 23·46	12 × 3½ × ·64 21·9	11½ × 3½ × ·62 20·58	11 × 3½ × ·60 19·12	11 × 3½ × ·56 18·44	10½ × 3½ × ·62 19·82
2290					12 × 3½ × ·72 23·98	12 × 3½ × ·68 22·94	11½ × 3½ × ·66 21·58	11½ × 3½ × ·62 20·58	11 × 3½ × ·60 19·12
2480							12 × 3½ × ·72 23·98	12 × 3½ × ·66 22·42	11½ × 3½ × ·66 21·58
2690									12 × 3½ × ·70 23·46
2910									
3160									
3460									

DECK GIRDERS at HEADS of WIDELY SPACED PILLARS, BULB ANGLE FACE BARS.

TABLE 17 *(Concluded.)*

Differences in Numerals for .04 in thickness of plate girder.

VALUES OF $\frac{S^2 \times B \times H}{100}$		DEPTH AND THICKNESS OF GIRDER.							
		28 Inches. 29 × ·54	29 Inches. 30 × ·56	30 Inches. 31 × ·56	31 Inches. 32 × ·56	32 Inches. 33 × ·58	33 Inches. 34 × ·58	34 Inches. 35 × ·60	35 Inches. 36 × ·60
190	^								
220									
260									
300									
350									
400									
460									
520									
580									
650									
730									
810									
900	SINGLE BULB ANGLES	6 × 3 × ·38 3·81	5½ × 3 × ·36 3·4						
990		7½ × 3 × ·44 5·16	6½ × 3 × ·44 4·52	6 × 3 × ·40 3·96					
1090		9 × 3 × ·48 6·49	8 × 3 × ·48 5·9	7½ × 3 × ·44 5·16	7 × 3 × ·42 4·67	6½ × 3 × ·38 4·04	5½ × 3 × ·36 3·4		
1200		10 × 3½ × ·52 7·86	9 × 3 × ·54 7·09	8½ × 3 × ·52 6·51	8 × 3 × ·48 5·9	7½ × 3 × ·44 5·16	7 × 3 × ·42 4·67	6½ × 3 × ·38 4·04	5½ × 3 × ·36 3·4
1320		11 × 3½ × ·56 9·07	10 × 3½ × ·56 8·3	9½ × 3½ × ·52 7·49	9 × 3 × ·54 7·09	8½ × 3 × ·50 6·32	8 × 3 × ·46 5·62	7½ × 3 × ·44 5·16	7 × 3 × ·42 4·67
1450		11½ × 3½ × ·62 10·29	11 × 3½ × ·58 9·32	10½ × 3½ × ·56 8·72	9½ × 3½ × ·56 7·93	9½ × 3½ × ·50 7·29	9 × 3 × ·50 6·69	8½ × 3 × ·48 6·12	7½ × 3 × ·48 5·5
1590	V	12 × 3½ × ·66 11·21	12 × 3½ × ·60 10·43	11 × 3½ × ·60 9·86	11 × 3½ × ·54 8·93	10 × 3½ × ·56 8·3	10 × 3½ × ·50 7·63	9 × 3 × ·52 6·89	8½ × 3 × ·50 6·32
1750	^	8½ × 3 × ·50 12·64	12 × 3½ × ·68 11·44	11½ × 3½ × ·66 10·49	11½ × 3½ × ·60 10·04	11 × 3½ × ·58 9·32	10½ × 3½ × ·54 8·48	9½ × 3½ × ·56 7·93	9½ × 3½ × ·50 7·29
1920		9½ × 3½ × ·48 14·12	9 × 3 × ·50 13·38	8½ × 3 × ·50 12·64	12 × 3½ × ·70 11·43	11½ × 3½ × ·66 10·49	11½ × 3½ × ·62 10·29	11 × 3½ × ·58 9·32	10½ × 3½ × ·56 8·72
2100		10 × 3½ × ·54 16·16	9 × 3½ × ·54 14·70	9 × 3 × ·54 14·18	9 × 3 × ·50 13·38	8½ × 3 × ·50 12·64	12 × 3½ × ·70 11·43	11½ × 3½ × ·66 10·49	11½ × 3½ × ·62 10·29
2290		11 × 3½ × ·56 18·14	10½ × 3½ × ·54 16·96	9½ × 3½ × ·56 15·86	9 × 3½ × ·54 14·7	9 × 3 × ·54 14·18	9 × 3 × ·50 13·38	8½ × 3 × ·50 12·6	12 × 3½ × ·70 11·43
2480		11½ × 3½ × ·62 20·58	11 × 3½ × ·58 18·64	10½ × 3½ × ·56 17·44	10½ × 3½ × ·52 16·5	9½ × 3½ × ·56 15·86	9 × 3½ × ·54 14·7	9 × 3 × ·54 14·18	9 × 3 × ·50 13·38
2690		12 × 3½ × ·66 22·42	11½ × 3½ × ·64 21·08	11 × 3½ × ·62 19·6	11 × 3½ × ·58 18·64	10½ × 3½ × ·58 17·9	10½ × 3½ × ·54 16·96	9½ × 3½ × ·56 15·86	9 × 3½ × ·54 14·7
2910		12 × 3½ × ·74 24·8	12 × 3½ × ·70 23·46	12 × 3½ × ·66 22·42	11½ × 3½ × ·64 21·08	11 × 3½ × ·62 19·6	11 × 3½ × ·58 18·64	10½ × 3½ × ·58 17·9	10½ × 3½ × ·54 16·96
3160				12 × 3½ × ·74 24·8	12 × 3½ × ·68 22·94	12 × 3½ × ·66 22·42	11½ × 3½ × ·64 21·08	11 × 3½ × ·62 19·6	11 × 3½ × ·58 18·64
3460	V						12 × 3½ × ·70 23·46	12 × 3½ × ·66 22·42	12 × 3½ × ·62 21·39

DOUBLE BULB ANGLES

SHELL PLATING.

FULL SCANTLING VESSELS.

TABLE 18

FIRST LONGITUDINAL NUMERAL. L × D	BREADTH OF FLAT PLATE KEEL AND GARBOARD STRAKE.	THICKNESS OF FLAT KEEL PLATE.		THICKNESS OF GARBOARD STRAKE WITH BAR KEEL.		THICKNESS OF SHELL PLATING.				
						From Flat Plate Keel or Garboard Strake to Upper Turn of Bilge.		From Upper Turn of Bilge to Strake Below Sheerstrake.		Propeller Boss Plates.
		For ½-Length Amids.	At Ends.	For ½-Length Amids.	At Ends.	For ½-Length Amids.	At Ends.	For ½-Length Amids.	At Ends.	Furnaced
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
800	35	·38	·34	·30	·26	·28	·24	·28	·24	·28
1100	36	·40	·36	·32	·28	·30	·26	·30	·26	·30
1450	37	·42	·38	·34	·30	·32	·28	·32	·28	·32
1900	38	·44	·40	·38	·34	·34	·30	·34	·30	·34
2400	39	·46	·42	·40	·36	·36	·32	·36	·32	·36
2900	40	·48	·44	·42	·38	·38	·34	·38	·34	·38
3500	41	·50	·46	·44	·40	·40	·36	·40	·36	·40
4200	42	·52	·48	·48	·42	·42	·38	·42	·38	·42
4900	43	·54	·50	·50	·44	·44	·38	·44	·38	·46
5650	44	·58	·54	·52	·46	·46	·40	·46	·40	·50
6450	45	·60	·56	·54	·48	·48	·40	·48	·40	·54
7300	46	·64	·58	·56	·50	·50	·42	·50	·40	·56
8200	47	·66	·60	·58	·50	·52	·42	·52	·42	·60
9100	47	·68	·62	·60	·52	·54	·44	·54	·42	·62
10000	48	·72	·64			·56	·44	·56	·42	·64
11000	49	·74	·66			·58	·46	·58	·44	·66
12000	49	·78	·68			·60	·46	·60	·44	·70
13000	50	·80	·70			·62	·48	·62	·46	·72
14000	51	·84	·74			·64	·48	·64	·46	·74
15100	52	·86	·76			·68	·50	·66	·46	·76
16200	53	·88	·80			·70	·50	·68	·48	·78
17400	54	·92	·82			·72	·52	·70	·48	·80
18600	55	·94	·84			·74	·52	·72	·50	·82
19800	56	·98	·86			·76	·54	·74	·50	·86
21100	57	1·00	·88			·78	·56	·76	·52	·88
22400	59	1·02	·90			·82	·56	·78	·52	·90
23800	60	1·06	·94			·84	·58	·80	·54	·92
25200	61	1·10	·98			·86	·60	·82	·56	·94
26700	62	1·12	1·02			·88	·60	·84	·56	·96

SHELL PLATING.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 19

FIRST LONGITUDINAL NUMERAL. L × D	BREADTH OF FLAT PLATE KEEL AND GARBOARD STRAKE.	THICKNESS OF FLAT PLATE KEEL.		THICKNESS OF GARBOARD STRAKE WITH BAR KEEL.		THICKNESS OF SHELL PLATING.				
						From Flat Plate Keel or Garboard Strake to Upper Turn of Bilge.		From Upper Turn of Bilge to Strake Below Sheerstrake.		Propeller Boss Plates.
		For ¾-Length Amids.	At Ends.	For ½-Length Amids.	At Ends.	For ½-Length Amids.	At Ends.	For ½-Length Amids.	At Ends.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3500	41	·44	·40	·40	·38	·38	·36	·38	·36	·40
4200	42	·46	·42	·42	·40	·40	·38	·40	·38	·42
4900	43	·48	·44	·44	·40	·42	·38	·42	·38	·46
5650	44	·50	·46	·46	·42	·44	·40	·44	·40	·50
6450	45	·52	·48	·48	·42	·44	·40	·44	·40	·54
7300	46	·56	·52	·50	·44	·46	·42	·46	·40	·56
8200	47	·58	·54	·52	·46	·48	·42	·48	·42	·56
9100	47	·60	·56	·54	·48	·50	·44	·50	·42	·56
10000	48	·64	·58			·52	·44	·52	·42	·60
11000	49	·66	·60			·52	·46	·52	·44	·60
12000	49	·70	·62			·54	·46	·54	·44	·62
13000	50	·72	·64			·56	·48	·56	·46	·64
14000	51	·76	·66			·58	·48	·58	·46	·66
15100	52	·78	·68			·60	·50	·60	·46	·70
16200	53	·80	·70			·62	·50	·62	·48	·72
17400	54	·84	·74			·66	·52	·64	·48	·74
18600	55	·86	·76			·68	·52	·66	·50	·76
19800	56	·90	·80			·70	·54	·68	·50	·78
21100	57	·92	·82			·72	·56	·70	·52	·80
22400	59	·94	·84			·74	·56	·72	·52	·82
23800	60	·96	·86			·76	·58	·74	·54	·86
25200	61	1·00	·88			·80	·60	·76	·56	·88
26700	62	1·02	·90			·82	·60	·78	·56	·90
28200	64	1·06	·94			·84	·62	·78	·58	·90
29800	65	1·08	·96			·86	·64	·80	·58	·92
31400	67	1·12	1·02			·88	·64	·82	·60	·94
33000	68	1·14	1·04			·90	·64	·84	·60	·96

TOPSIDE SCANTLINGS.

FULL SCANTLING VESSELS.

TABLE 20

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L × (B + D)	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 10												
			THICKNESSES FOR ½ LENGTH AMIDSHIPS.												
					UPPER DECK.										
					FLUSH DECK VESSELS.										
					When One Deck is Fitted.		When Two Decks are Fitted.				When Three Decks are Fitted.		Increase to Stringer Plate, Deck Plating and Tie Plates for Vessels having 100 per Cent. Superstructures.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
							2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.				
	Sheer-strake and Strake below.	Stringer Plate.	Sheer-strake.	Strake below Sheer-strake.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.			
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1500	40		·28	·28	15 × ·30	10 × ·30							·02		
2000	40		·30	·30	15 × ·30	10 × ·30							·02		
2500	41		·30	·30	16 × ·30	10 × ·30							·02		
3000	41		·32	·32	17 × ·30	10 × ·30							·02		
3500	41		·32	·32	18 × ·32	10 × ·32							·02		
4000	42		·34	·34	19 × ·32	10 × ·32							·02		
4500	42		·34	·34	20 × ·32	10 × ·32							·02		
5000	43		·36	·36	21 × ·34	10 × ·34							·02		
5750	43		·36	·36	23 × ·34	11 × ·34							·02		
6500	44		·38	·38	25 × ·36	12 × ·36							·04		
7250	44		·38	·38	27 × ·36	13 × ·36							·06		
8000	44		·40	·40	30 × ·36	14 × ·36							·08		
9000	45		·42	·42	32 × ·38	15 × ·38							·10		
10000	45	45	·42	·42	34 × ·38	16 × ·38							·14	·30	·32
11000	45	45	·44	·44	38 × ·40	17 × ·40							·16	·30	·32
12000	46	45	·46	·44	42 × ·42	20 × ·42	42 × ·42	12 × ·42	·34				·16	·30	·32
13000	46	45	·48	·46	44 × ·44	20 × ·44	42 × ·44	14 × ·44	·34				·18	·30	·32
14000	46	45	·50	·48	48 × ·46	23 × ·46	42 × ·46	16 × ·46	·38				·18	·30	·32
15000	47	45	·50	·48	50 × ·48	25 × ·48	44 × ·46	18 × ·46	·40				·20	·30	·32
16000	47	45	·52	·50	50 × ·48	28 × ·48	45 × ·48	20 × ·48	·40				·22	·30	·34
17000	47	45	·52	·50	52 × ·50	32 × ·50	48 × ·48	23 × ·48	·40				·22	·30	·34
18000	48	45	·54	·52	55 × ·50	37 × ·50	50 × ·50	28 × ·50	·42		·40		·22	·30	34
19000	48	45	·54	·52	55 × ·50	47 × ·50	53 × ·50	34 × ·50	·42		·40		·22	·32	·34
20000	48	46	·54	·52	·42	·30	·42	·30	·42		·40		·14	·32	·36
21000	48	47	·56	·54	·46	·30	·44	·30	·44		·42		·14	·32	·36
22000	48	48	·56	·54	·50	·32	·44	·30	·44		·42		·14	·32	·36
23000	49	49	·58	·56	·52	·34	·46	·30	·44		·42		·14	·32	·38
24000	49	50	·58	·56	·52	·36	·50	·30	·44		·44		·14	·34	·38

TOPSIDE SCANTLINGS.

FULL SCANTLING VESSELS.

TABLE 20

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 10 — THICKNESSES FOR ½ LENGTH AMIDSHIPS.													
					UPPER DECK.											
					FLUSH DECK VESSELS.											
					When One Deck is Fitted.		When Two Decks are Fitted.				When Three Decks are Fitted.		Increase to Stringer Plate, Deck Plating and Tie Plates for Vessels having 100 per Cent. Superstructures.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
							2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.				
	Sheer-strake and Strake below.	Stringer Plate.	Sheer-strake.	Strake below Sheer-strake.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.			
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
25500	49	51	·60	·58	·54	·40	·52	·34	·46		·44		·14	·34	·38
27000	49	52	·62	·60	·56	·42	·56	·36	·46	·30	·46	·30	·14	·34	·40
28500	50	53	·64	·62	·56	·46	·56	·40	·50	·30	·46	·30	·14	·36	·40
30000	50	54	·64	·62	·58	·50	·58	·44	·54	·30	·50	·30	·16	·36	·42
31500	50	55	·66	·64	·58	·54			·56	·30	·54	·30	·16	·36	·42
33000	50	56	·66	·64	·60	·58			·60	·34	·56	·32	·16	·36	·42
34500	50	57	·68	·66	·62	·62			·60	·38	·60	·34	·16	·38	·44
36000	50	58	·68	·66	·66	·64			·60	·42	·60	·36	·16	·38	·44
37500	51	59	·70	·68	·68	·68			·60	·44	·60	·38	·16	·40	·44
39000	51	60	·70	·68	·72	·72			·62	·46	·62	·40	·16	·40	·44
40500	51	61	·72	·70	·74	·74			·62	·50	·62	·42	·16	·40	·46
42000	51	62	·72	·70	·78	·78			·64	·52	·64	·44	·16	·40	·46
43500	51	63	·74	·72	·82	·82			·64	·56	·64	·48	·16	·42	·46
45000	52	64	·74	·72	·84	·84			·66	·58	·66	·50	·16	·42	·46
46500	52	65	·74	·72					·66	·62	·66	·52	·16	·42	·46
48000	52	66	·76	·74					·68	·64	·68	·54	·16	·42	·48
50000	52	68	·76	·74					·70	·68	·68	·58	·16	·44	·48
52000	53	69	·78	·76					·72	·70	·70	·60	·16	·44	·48
54000	53	70	·80	·78					·74	·74	·72	·64	·16	·44	·48
56000	53	72	·82	·80					·76	·76	·74	·66	·16	·46	·48
58000	54	74	·82	·80					·80	·80	·74	·70	·16	·46	·48
60000	54	76	·84	·82					·82	·82	·76	·74	·16	·46	·48
62000	54	77	·84	·82					·84	·84	·76	·78	·16	·48	·48
64000	55	79	·86	·84					·86	·86	·80	·80	·16	·48	·48
66000	55	80	·88	·86					·88	·88	·84	·84	·16	·48	·48
68000	56	81	·88	·86					·90	·90	·86	·86	·16	·48	·48
70000	56	83	·90	·88					·94	·94	·90	·90	·16	·50	·50

x 2

TOPSIDE SCANTLINGS.

FULL SCANTLING VESSELS.

TABLE 20

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 11													
			THICKNESSES FOR ½ LENGTH AMIDSHIPS.													
					UPPER DECK.											
					FLUSH DECK VESSELS.											
					When One Deck is Fitted.		When Two Decks are Fitted.				When Three Decks are Fitted.		Increase to Stringer Plate, Deck Plating and Tie Plates for Vessels having 100 per Cent. Superstructures.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
							2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.				
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.			
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1500	40		·30	·30	15×·30	10×·30							·02		
2000	40		·30	·30	16×·30	10×·30							·02		
2500	41		·32	·32	17×·32	10×·32							·02		
3000	41		·32	·32	18×·32	10×·32							·02		
3500	41		·34	·32	19×·32	10×·32							·02		
4000	42		·36	·34	20×·34	10×·34							·02		
4500	42		·36	·36	22×·34	10×·34							·02		
5000	43		·38	·38	24×·36	10×·36							·02		
5750	43		·38	·38	26×·36	11×·36							·02		
6500	44		·40	·40	28×·36	12×·36							·04		
7250	44		·40	·40	30×·36	13×·36							·06		
8000	44		·42	·42	32×·38	14×·38							·08		
9000	45		·44	·42	35×·40	15×·40							·10		
10000	45	45	·44	·42	38×·40	16×·40							·14	·30	·32
11000	45	45	·46	·44	40×·42	18×·42							·16	·30	·32
12000	46	45	·48	·46	44×·44	20×·44	42×·44	16×·44	·36				·18	·30	·32
13000	46	45	·50	·48	47×·46	20×·46	43×·44	19×·44	·36				·18	·30	·32
14000	46	45	·52	·48	50×·48	25×·48	45×·46	24×·46	·38				·20	·30	·32
15000	47	45	·52	·48	53×·48	32×·48	47×·48	26×·48	·38				·20	·30	·32
16000	47	45	·54	·50	55×·50	39×·50	50×·50	28×·50	·40				·22	·30	·32
17000	47	45	·54	·50	·44	·30	·40	·30	·40				·14	·32	·34
18000	48	45	·56	·52	·48	·30	·42	·30	·40		·40		·14	·32	·34
19000	48	46	·56	·52	·50	·34	·46	·30	·42		·40		·14	·32	·34
20000	48	46	·56	·52	·52	·36	·50	·30	·42		·40		·14	·32	·34
21000	48	47	·58	·54	·52	·38	·50	·32	·44	·30	·42	·30	·14	·32	·36
22000	48	48	·58	·54	·52	·42	·52	·34	·44	·30	·42	·30	·14	·34	·36
23000	49	49	·60	·56	·54	·44	·54	·36	·50	·30	·44	·30	·14	·34	·36
24000	49	50	·62	·58	·56	·46	·56	·38	·54	·30	·50	·30	·14	·34	·38

TOPSIDE SCANTLINGS.

FULL SCANTLING VESSELS.

TABLE 20

(See Continuation.)

PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK.

11

THICKNESSES FOR $\frac{1}{2}$ LENGTH AMIDSHIPS.

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		UPPER DECK.											
					FLUSH DECK VESSELS.									
					When One Deck is Fitted.		When Two Decks are Fitted.				When Three Decks are Fitted.		Increase to Stringer Plate, Deck Plating and Tie Plates for Vessels having 100 per Cent. Superstructures.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
							2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.				
	Sheer-strake and Strake below.	Stringer Plate.	Sheer-strake.	Strake below Sheer-strake.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.			
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
25500	49	51	·64	·60	·58	·50	·58	·42	·56	·32	·54	·30	·14	·34	·38
27000	49	52	·66	·62	·60	·54	·60	·46	·60	·34	·60	·30	·14	·36	·38
28500	50	53	·68	·62	·60	·58	·60	·50	·60	·38	·60	·34	·14	·36	·40
30000	50	54	·68	·64	·62	·62	·62	·54	·62	·40	·62	·36	·16	·36	·40
31500	50	55	·70	·66	·66	·64			·62	·44	·62	·40	·16	·38	·42
33000	50	56	·70	·66	·68	·68			·64	·46	·64	·42	·16	·38	·42
34500	50	57	·72	·68	·72	·70			·64	·50	·64	·46	·16	·38	·42
36000	50	58	·74	·68	·74	·74			·66	·54	·66	·48	·16	·40	·44
37500	51	59	·74	·68	·76	·76			·66	·58	·66	·52	·16	·40	·44
39000	51	60	·76	·70	·80	·80			·68	·60	·68	·54	·16	·40	·44
40500	51	61	·78	·72	·82	·82			·68	·64	·68	·58	·16	·40	·44
42000	51	62	·78	·72	·86	·86			·70	·66	·70	·60	·16	·42	·46
43500	51	63	·80	·74	·88	·88			·72	·68	·70	·64	·16	·42	·46
45000	52	64	·82	·76	·92	·92			·74	·72	·72	·66	·16	·42	·46
46500	52	65	·82	·76					·76	·76	·72	·70	·16	·42	·48
48000	52	66	·84	·78					·78	·78	·74	·72	·16	·42	·48
50000	52	68	·84	·80					·82	·82	·76	·76	·16	·44	·48
52000	53	69	·86	·80					·84	·84	·78	·78	·16	·44	·48
54000	53	70	·88	·82					·86	·86	·80	·80	·16	·44	·48
56000	53	72	·90	·84					·88	·88	·82	·82	·16	·46	·48
58000	54	74	·90	·84					·90	·90	·84	·84	·16	·46	·48
60000	54	76	·92	·86					·94	·94	·86	·86	·16	·46	·48
62000	54	77	·92	·86					·96	·96	·90	·90	·18	·48	·48
64000	55	79	·94	·88					1·00	1·00	·92	·92	·18	·48	·48
66000	55	80	·96	·90					1·04	1·04	·96	·96	·18	·48	·48
68000	56	81	·96	·90					1·06	1·06	·98	·98	·18	·48	·48
70000	56	83	·98	·92					1·10	1·10	1·02	1·02	·18	·50	·50

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TOPSIDE SCANTLINGS.

FULL SCANTLING VESSELS.

TABLE 20

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L × (B + D)	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 12													
			THICKNESSES FOR ½ LENGTH AMIDSHIPS.													
					UPPER DECK.											
					FLUSH DECK VESSELS.											
					When One Deck is Fitted.		When Two Decks are Fitted.				When Three Decks are Fitted.		Increase to Stringer Plate, Deck Plating and Tie Plates for Vessels having 100 per Cent. Superstructures.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
							2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.				
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.			
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1500	40		·30	·30	16 × ·30	10 × ·30							·02		
2000	40		·30	·30	17 × ·30	10 × ·30							·02		
2500	41		·32	·30	18 × ·32	10 × ·32							·02		
3000	41		·34	·32	19 × ·32	10 × ·32							·02		
3500	41		·34	·32	21 × ·34	10 × ·34							·02		
4000	42		·36	·34	23 × ·34	10 × ·34							·02		
4500	42		·38	·36	25 × ·36	10 × ·36							·02		
5000	43		·40	·38	27 × ·36	11 × ·36							·02		
5750	43		·40	·38	29 × ·36	12 × ·36							·02		
6500	44		·42	·40	31 × ·38	13 × ·38							·04		
7250	44		·42	·40	33 × ·38	14 × ·38							·06		
8000	44		·44	·42	36 × ·38	15 × ·38							·08		
9000	45		·46	·44	38 × ·40	16 × ·40							·10		
10000	45	45	·46	·44	40 × ·40	18 × ·40							·14	·30	·32
11000	45	45	·48	·46	42 × ·42	20 × ·42							·16	·30	·32
12000	46	45	·50	·46	44 × ·44	22 × ·44	42 × ·44	17 × ·44	·38				·18	·30	·32
13000	46	45	·52	·48	47 × ·48	22 × ·48	44 × ·44	19 × ·44	·38				·18	·30	·32
14000	46	45	·54	·50	50 × ·50	25 × ·50	46 × ·46	24 × ·46	·38				·20	·30	·32
15000	47	45	·54	·50	54 × ·50	32 × ·50	48 × ·48	26 × ·48	·40				·20	·32	·32
16000	47	45	·56	·52	58 × ·50	39 × ·50	52 × ·50	28 × ·50	·40				·22	·32	·32
17000	47	45	·56	·52	·50	·30	·42	·30	·40				·14	·32	·34
18000	48	45	·58	·54	·52	·30	·44	·30	·42		·40		·14	·34	·34
19000	48	46	·58	·54	·52	·34	·50	·30	·44		·42		·14	·34	·34
20000	48	46	·60	·56	·54	·36	·54	·30	·46	·30	·44	·30	·14	·34	·34
21000	48	47	·62	·58	·56	·38	·54	·32	·50	·30	·48	·30	·14	·34	·36
22000	48	48	·62	·58	·58	·42	·56	·36	·52	·30	·52	·30	·16	·36	·36
23000	49	49	·64	·60	·58	·46	·58	·38	·56	·30	·54	·30	·16	·36	·36
24000	49	50	·66	·60	·60	·48	·60	·42	·58	·32	·58	·32	·16	·36	·38

TOPSIDE SCANTLINGS.

FULL SCANTLING VESSELS.

TABLE 20

(See Continuation.)

PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK.

12

THICKNESSES FOR ½ LENGTH AMIDSHIPS.

SECOND LONGITUDINAL NUMERAL. L × (B + D)	BREADTH OF		UPPER DECK.												
					FLUSH DECK VESSELS.										
					When One Deck is Fitted.		When Two Decks are Fitted.				When Three Decks are Fitted.		Increase to Stringer Plate, Deck Plating and Tie Plates for Vessels having 100 per Cent. Superstructures.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
							2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.				
	Sheer-strake and Strake below.	Stringer Plate.	Sheer-strake.	Strake below Sheer-strake.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.			
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
25500	49	51	·68	·62	·62	·52	·62	·46	·60	·36	·58	·36	·18	·38	·38
27000	49	52	·70	·64	·64	·56	·64	·52	·62	·40	·60	·38	·18	·38	·38
28500	50	53	·72	·64	·64	·60	·64	·58	·62	·44	·60	·42	·18	·38	·40
30000	50	54	·72	·66	·66	·66	·64	·62	·64	·46	·62	·44	·18	·38	·40
31500	50	55	·74	·68	·70	·70			·66	·48	·64	·46	·20	·40	·42
33000	50	56	·76	·68	·74	·72			·68	·50	·68	·46	·20	·40	·42
34500	50	57	·78	·70	·76	·76			·70	·54	·70	·50	·20	·40	·42
36000	50	58	·80	·72	·78	·78			·70	·58	·70	·54	·20	·40	·44
37500	51	59	·80	·72	·82	·82			·72	·60	·72	·58	·20	·42	·44
39000	51	60	·82	·74	·86	·86			·72	·64	·72	·60	·20	·42	·44
40500	51	61	·84	·76					·74	·66	·74	·62	·20	·42	·44
42000	51	62	·86	·76					·74	·70	·74	·66	·20	·42	·46
43500	51	63	·88	·78					·76	·72	·76	·68	·20	·44	·46
45000	52	64	·90	·80					·78	·76	·78	·70	·20	·44	·46
46500	52	65	·90	·80					·80	·78	·80	·72	·20	·44	·48
48000	52	66	·92	·82					·80	·80	·80	·74	·20	·44	·48
50000	52	68	·92	·84					·84	·84	·82	·78	·20	·46	·48
52000	53	69	·94	·84					·86	·86	·82	·82	·20	·46	·48
54000	53	70	·96	·86					·90	·90	·84	·84	·20	·46	·48
56000	53	72	·98	·88					·94	·94	·86	·86	·20	·46	·48
58000	54	74	·98	·88					·98	·96	·90	·90	·20	·46	·48
60000	54	76	1·00	·90					1·00	1·00	·94	·94	·20	·48	·48
62000	54	77	1·00	·90					1·04	1·04	·98	·98	·20	·48	·48
64000	55	79	1·02	·92					1·10	1·10	1·00	1·00	·20	·48	·48
66000	55	80	1·04	·94					1·14	1·14	1·04	1·04	·20	·50	·50
68000	56	81	1·04	·94					1·18	1·18	1·08	1·08	·20	·50	·50
70000	56	83	1·06	·96					1·22	1·22	1·12	1·12	·20	·50	·50

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TOPSIDE SCANTLINGS.

FULL SCANTLING VESSELS.

TABLE 20

(See Continuation.)

PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK.

13

THICKNESSES FOR ½ LENGTH AMIDSHIPS.

UPPER DECK.

FLUSH DECK VESSELS.

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		Sheer-strake.	Strake below Sheer-strake.	When One Deck is Fitted.		When Two Decks are Fitted.				When Three Decks are Fitted.		Increase to Stringer Plate, Deck Plating and Tie Plates for Vessels having 100 per Cent. Super-structures.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
							2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.				
	Sheer-strake and Strake below.	Stringer Plate.			Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.			
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1500	40		·32	·32	19×·30	10×·30							·02		
2000	40		·34	·32	20×·32	10×·32							·02		
2500	41		·34	·32	22×·32	10×·32							·02		
3000	41		·36	·34	24×·34	10×·34							·02		
3500	41		·36	·34	24×·34	10×·34							·02		
4000	42		·38	·36	26×·36	10×·36							·02		
4500	42		·40	·36	28×·36	10×·36							·02		
5000	43		·42	·38	30×·38	11×·38							·02		
5750	43		·42	·38	32×·38	12×·38							·02		
6500	44		·44	·40	34×·40	13×·40							·04		
7250	44		·44	·42	36×·40	14×·40							·06		
8000	44		·46	·44	39×·40	15×·40							·08		
9000	45		·48	·44	41×·42	16×·42							·10		
10000	45	45	·50	·46	43×·44	18×·44							·14	·30	·32
11000	45	45	·52	·48	43×·46	20×·46							·16	·30	·32
12000	46	45	·54	·48	46×·46	22×·46	42×·44	18×·44	·40				·18	·30	·32
13000	46	45	·56	·50	48×·48	23×·48	44×·44	21×·44	·40				·18	·30	·32
14000	46	45	·58	·50	50×·50	30×·50	46×·46	25×·46	·42				·20	·30	·32
15000	47	45	·60	·52	54×·50	33×·50	49×·48	29×·48	·42				·20	·32	·32
16000	47	45	·62	·54	·46	·30	·42	·30	·42				·14	·32	·32
17000	47	45	·62	·56	·50	·30	·46	·30	·44				·14	·34	·34
18000	48	45	·64	·56	·52	·32	·48	·30	·44	·30	·42		·14	·34	·34
19000	48	46	·66	·58	·56	·34	·54	·30	·46	·30	·44		·14	·34	·34
20000	48	46	·68	·58	·60	·36	·58	·32	·50	·30	·48	·30	·16	·36	·36
21000	48	47	·70	·60	·62	·38	·60	·34	·54	·30	·52	·30	·16	·36	·36
22000	48	48	·72	·62	·62	·42	·62	·36	·58	·30	·58	·30	·16	·38	·38
23000	49	49	·74	·64	·64	·46	·64	·38	·62	·32	·60	·32	·18	·38	·38
24000	49	50	·76	·66	·66	·48	·66	·40	·62	·36	·64	·34	·18	·38	·38

TOPSIDE SCANTLINGS.

FULL SCANTLING VESSELS.

TABLE 20

(See Continuation.)

PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK.

13

THICKNESSES FOR $\frac{1}{2}$ LENGTH AMIDSHIPS.

UPPER DECK.

FLUSH DECK VESSELS.

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		Sheer-strake.	Strake below Sheer-strake.	When One Deck is Fitted.		When Two Decks are Fitted.				When Three Decks are Fitted.		Increase to Stringer Plate, Deck Plating and Tie Plates for Vessels having 100 per Cent. Super-structures.	Deck Plating within Line of Deck Openings.	Minimum for Un-sheathed Deck Plating abreast Deck Openings
							2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.				
	Sheer-strake and Strake below.	Stringer Plate.			Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.			
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
25500	49	51	·78	·66	·68	·52	·68	·46	·66	·38	·64	·36	·20	·38	·38
27000	49	52	·80	·68	·70	·56	·70	·52	·68	·40	·68	·38	·20	·40	·40
28500	50	53	·82	·68	·72	·60	·70	·58	·68	·44	·70	·42	·20	·40	·40
30000	50	54	·84	·72	·72	·66	·72	·62	·72	·46	·72	·44	·22	·40	·40
31500	50	55	·86	·74	·76	·70			·74	·50	·74	·46	·22	·42	·42
33000	50	56	·88	·74	·78	·74			·76	·54	·76	·50	·22	·42	·42
34500	50	57	·90	·76	·80	·78			·78	·58	·78	·54	·22	·42	·42
36000	50	58	·92	·78	·82	·80			·80	·62	·78	·58	·24	·42	·42
37500	51	59	·92	·80					·80	·64	·80	·62	·24	·44	·44
39000	51	60	·94	·82					·84	·68	·84	·64	·24	·44	·44
40500	51	61	·96	·82					·84	·70	·84	·66	·24	·44	·44
42000	51	62	·98	·82					·86	·72	·86	·68	·24	·46	·46
43500	51	63	1·00	·84					·88	·76	·88	·72	·24	·46	·46
45000	52	64	1·02	·86					·90	·80	·90	·74	·24	·46	·46
46500	52	65	1·02	·88					·92	·82	·92	·76	·24	·46	·46
48000	52	66	1·04	·90					·92	·84	·92	·80	·24	·48	·48
50000	52	68	1·06	·92					·96	·88	·94	·82	·24	·48	·48
52000	53	69	1·08	·92					·98	·92	·96	·84	·24	·48	·48
54000	53	70	1·10	·94					1·00	·96	·98	·88	·24	·48	·48
56000	53	72	1·12	·96					1·02	1·00	1·00	·92	·24	·48	·48
58000	54	74	1·14	·96					1·04	1·04	1·02	·96	·24	·50	·50
60000	54	76	1·16	·98					1·08	1·08	1·06	1·00	·24	·50	·50
62000	54	77	1·16	1·00					1·12	1·12	1·10	1·04	·24	·50	·50
64000	55	79	1·18	1·02					1·16	1·16	1·14	1·08	·24	·50	·50
66000	55	80	1·20	1·04					1·20	1·20	1·18	1·12	·24	·50	·50
68000	56	81	1·22	1·06							1·22	1·16	·24	·50	·50
70000															

TOPSIDE SCANTLINGS.

FULL SCANTLING VESSELS.

TABLE 20

(See Continuation.)

I 8

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 13½												THICKNESSES AT ENDS.	
			THICKNESSES FOR ½ LENGTH AMIDSHIPS.													
					UPPER DECK.											
					FLUSH DECK VESSELS.											
					When One Deck is Fitted.		When Two Decks are Fitted.				When Three Decks are Fitted.		Increase to Stringer Plate, Deck Plating and Tie Plates for Vessels having 100 per Cent. Superstructures.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings	Stringer Plates at Ends of Upper Deck, also Thickness of Tie Plates at Ends.	Thickness of Upper Deck Plating at Ends.
							2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.						
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.					
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1500	40		·34	·32	20×·30	10×·30							·02			12×·24	
2000	40		·36	·32	22×·32	10×·32							·02			12×·24	
2500	41		·36	·32	24×·32	10×·32							·02			13×·24	
3000	41		·38	·34	26×·34	10×·34							·02			14×·24	
3500	41		·38	·34	26×·34	10×·34							·02			15×·26	
4000	42		·40	·36	28×·36	10×·36							·02			16×·26	
4500	42		·40	·36	30×·36	10×·36							·02			17×·28	
5000	43		·42	·38	32×·38	11×·38							·02			18×·28	
5750	43		·42	·38	34×·38	12×·38							·02			20×·30	
6500	44		·44	·40	36×·40	13×·40							·04			21×·32	
7250	44		·46	·42	38×·40	14×·40							·06			23×·32	
8000	44		·48	·44	40×·42	15×·42							·08			25×·34	
9000	45		·50	·44	42×·44	16×·44							·10			26×·34	
10000	45	45	·52	·46	44×·46	18×·46							·14	·30	·32	27×·34	·30
11000	45	45	·54	·48	44×·48	20×·48							·16	·30	·32	28×·34	·30
12000	46	45	·56	·50	46×·48	22×·48	42×·44	18×·44	·40				·18	·30	·32	29×·34	·30
13000	46	45	·58	·50	48×·48	24×·48	44×·44	21×·44	·40				·18	·30	·32	30×·34	·30
14000	46	45	·60	·52	50×·50	27×·50	46×·46	25×·46	·42				·20	·30	·32	31×·34	·30
15000	47	45	·62	·54	55×·50	34×·50	50×·48	30×·48	·42				·20	·32	·32	32×·36	·30
16000	47	45	·64	·56	·46	·30	·42	·30	·42				·14	·32	·32	33×·36	·30
17000	47	45	·66	·58	·52	·30	·46	·30	·44				·14	·34	·34	33×·36	·30
18000	48	45	·68	·58	·54	·32	·50	·30	·44	·30	·42		·14	·34	·34	34×·36	·30
19000	48	46	·70	·60	·58	·34	·56	·30	·46	·30	·44		·14	·34	·34	34×·38	·30
20000	48	46	·72	·60	·62	·36	·60	·32	·52	·30	·50	·30	·16	·36	·36	35×·38	·30
21000	48	47	·74	·62	·64	·38	·62	·34	·56	·30	·54	·30	·16	·36	·36	35×·38	·30
22000	48	48	·76	·64	·64	·42	·64	·36	·62	·30	·60	·30	·16	·38	·38	35×·38	·30
23000	49	49	·78	·66	·66	·46	·66	·40	·64	·32	·62	·32	·18	·38	·38	36×·38	·30
24000	49	50	·80	·68	·68	·48	·68	·42	·66	·36	·66	·34	·18	·38	·38	36×·38	·32

The thicknesses of the Sheerstrake and of the Strake below the Sheerstrake at the ends of the vessel may be the same as the thickness of the side plating at the ends of the vessel.

SCANTLINGS.

NTLING VESSELS.

TABLE 20

(Concluded.)

H OF VESSEL TO DEPTH TO UPPER DECK.
$13\frac{1}{2}$

S FOR $\frac{1}{2}$ LENGTH AMIDSHIPS.

UPPER DECK.

CK VESSELS								THICKNESSES AT ENDS.	
Decks are Fitted.			When Three Decks are Fitted.		Increase to Stringer Plate, Deck Plating and Tie Plates for Vessels having 100 per Cent. Super-structures.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck-Plating abreast Deck Openings	Stringer Plates at Ends of Upper Deck, also Thickness of Tie Plates at Ends.	Thickness of Upper Deck Plating at Ends.
agers s.	2nd Deck of Steel.		2nd and 3rd Decks of Steel.						
ck ting.	Stringer Plate.	Deck Plating	Stringer Plate.	Deck Plating.					
hes.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
8	·68	·38	·68	·36	·20	·38	·38	36 × ·40	·32
2	·72	·40	·72	·38	·20	·40	·40	37 × ·40	·32
8	·72	·44	·72	·42	·20	·40	·40	37 × ·40	·32
2	·76	·46	·76	·44	·22	·40	·40	37 × ·40	·34
	·78	·50	·78	·46	·22	·42	·42	38 × ·40	·34
	·80	·54	·80	·50	·22	·42	·42	38 × ·42	·34
	·82	·58	·82	·54	·22	·42	·42	38 × ·42	·34
	·84	·62	·84	·58	·24	·42	·42	39 × ·42	·36
	·84	·66	·84	·62	·24	·44	·44	39 × ·42	·36
	·88	·68	·88	·64	·24	·44	·44	39 × ·42	·36
	·88	·72	·88	·68	·24	·44	·44	40 × ·44	·36
	·90	·74	·90	·70	·24	·46	·46	40 × ·44	·36
	·92	·78	·92	·72	·24	·46	·46	40 × ·44	·36
	·94	·82	·94	·76	·24	·46	·46	41 × ·44	·36
	·96	·84	·96	·78	·24	·46	·46	41 × ·44	·36
	·98	·86	·98	·82	·24	·48	·48	41 × ·44	·36
	1·00	·90	1·00	·84	·24	·48	·48	42 × ·46	·36
	1·02	·94	1·02	·86	·24	·48	·48	42 × ·46	·36
	1·04	·98	1·04	·88	·24	·48	·48	42 × ·46	·38
	1·06	1·02	1·06	·94	·24	·48	·48	43 × ·46	·38
	1·08	1·08	1·08	·98	·24	·50	·50	43 × ·46	·38
	1·12	1·12	1·10	1·02	·24	·50	·50	43 × ·46	·38
								44 × ·46	·38
								44 × ·48	·38
								44 × ·48	·38
								45 × ·48	·38
								45 × ·48	·38

he Sheerstrake at the ends of the vessel may be the same as the thickness

TOPSIDE SCANTLINGS.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 21

(See Continuation.)

PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 10

THICKNESSES FOR ½ LENGTH AMIDSHIPS.

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		Sheerstrake.	Strake below Sheerstrake.	UPPER DECK.						Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
					When Two Decks are Fitted.				When Three Steel Decks are Fitted.			
					2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.			
	Sheerstrake and Strake below.	Stringer Plate.			Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12000	46	45	·40	·40	42×·42	12×·42	·34				·30	·32
13000	46	45	·42	·42	42×·42	12×·42	·36				·30	·32
14000	46	45	·44	·44	43×·42	12×·42	·38				·30	·32
15000	47	45	·46	·46	43×·42	13×·42	·40				·30	·32
16000	47	45	·46	·46	44×·42	14×·42	·40				·30	·34
17000	47	45	·48	·48	45×·44	15×·44	·40				·30	·34
18000	48	45	·48	·48	46×·44	18×·44	·42		·38		·30	·34
19000	48	46	·50	·50	46×·46	25×·46	·42		·40		·30	·34
20000	48	46	·50	·50	50×·48	27×·48	·42		·40		·30	·36
21000	48	47	·52	·52	53×·48	32×·48	·44		·42		·30	·36
22000	48	48	·52	·52	55×·50	35×·50	·44		·42		·32	·36
23000	49	49	·54	·54	57×·50	40×·50	·44		·42		·32	·38
24000	49	50	·56	·56	60×·50	45×·50	·44		·44		·32	·38
25500	49	51	·58	·58	·48	·32	·46		·44		·32	·38
27000	49	52	·58	·58	·50	·34	·46		·46		·34	·40
28500	50	53	·60	·60	·52	·38	·48		·46		·34	·40
30000	50	54	·62	·60	·54	·40	·48		·48		·34	·42
31500	50	55	·62	·60	·56	·44	·50	·36	·50		·36	·42
33000	50	56	·64	·62	·58	·46	·50	·38	·50		·36	·42
34500	50	57	·64	·62	·58	·50	·52	·38	·52		·36	·44
36000	50	58	·64	·62	·58	·54	·54	·40	·52	·36	·36	·44
37500	51	59	·66	·64			·56	·42	·52	·38	·38	·44
39000	51	60	·66	·64			·56	·44	·54	·38	·38	·44
40500	51	61	·68	·66			·58	·46	·56	·40	·40	·46

TOPSIDE SCANTLINGS.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 21

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 10 — THICKNESSES FOR ½ LENGTH AMIDSHIPS.								
					UPPER DECK.						
					When Two Decks are Fitted.				When Three Steel Decks are Fitted.		
					2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.		
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
42000	51	62	·68	·66			·60	·48	·58	·40	·40	·46
43500	51	63	·70	·68			·62	·52	·60	·42	·42	·46
45000	52	64	·72	·70			·64	·54	·62	·44	·42	·48
46500	52	65	·74	·72			·66	·56	·64	·46	·42	·48
48000	52	66	·74	·72			·68	·58	·66	·50	·42	·48
50000	52	68	·76	·74			·70	·62	·68	·54	·44	·48
52000	53	69	·76	·74			·70	·66	·68	·56	·44	·48
54000	53	70	·78	·76			·72	·70	·70	·60	·44	·48
56000	53	72	·78	·76			·74	·74	·70	·62	·46	·48
58000	54	74	·80	·78			·78	·78	·72	·66	·46	·48
60000	54	76	·80	·78			·82	·82	·74	·70	·46	·48
62000	54	77	·82	·80			·84	·84	·76	·74	·48	·48
64000	55	79	·82	·80			·86	·86	·78	·76	·48	·48
66000	55	80	·82	·80			·90	·90	·80	·80	·48	·48
68000	56	81	·82	·80			·92	·92	·84	·84	·48	·48
70000	56	82	·84	·82			·96	·96	·86	·86	·50	·50
72000	56	84	·86	·84			1·00	1·00	·90	·90	·50	·50
74500	56	86	·86	·84			1·04	1·04	·92	·92	·50	·50
77000	57	88	·88	·86			1·08	1·08	·96	·96	·52	·52
79500	57	90	·90	·88			1·12	1·12	1·00	1·00	·52	·52
82000	58	92	·92	·90			1·16	1·16	1·04	1·04	·52	·52
84500	59	94	·94	·92			1·20	1·20	1·08	1·08	·54	·54
87000	60	96	·94	·92					1·12	1·12	·54	·54

I 8

TOPSIDE SCANTLINGS.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 21

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L × (B + D)	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 11									
			THICKNESSES FOR ½ LENGTH AMIDSHIPS.									
					UPPER DECK.							
					When Two Decks are Fitted.				When Three Steel Decks are Fitted.			
					2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.		Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12000	46	45	·42	·42	42 × ·42	12 × ·42	·36				·30	·32
13000	46	45	·44	·44	42 × ·42	12 × ·42	·36				·30	·32
14000	46	45	·46	·46	43 × ·42	12 × ·42	·38				·30	·32
15000	47	45	·46	·46	43 × ·42	13 × ·42	·38				·30	·32
16000	47	45	·48	·48	44 × ·44	14 × ·44	·40				·30	·32
17000	47	45	·48	·48	45 × ·44	15 × ·44	·40				·30	·34
18000	48	45	·50	·50	46 × ·46	18 × ·46	·40		·38		·30	·34
19000	48	46	·50	·50	47 × ·46	25 × ·46	·42		·40		·30	·34
20000	48	46	·52	·50	51 × ·48	27 × ·48	·42		·40		·30	·34
21000	48	47	·52	·52	54 × ·48	32 × ·48	·44		·42		·30	·36
22000	48	48	·54	·52	57 × ·50	35 × ·50	·44		·42		·32	·36
23000	49	49	·56	·54	60 × ·50	40 × ·50	·46		·44		·32	·36
24000	49	50	·58	·56	·48	·32	·48		·44		·32	·38
25500	49	51	·60	·58	·50	·34	·50		·46		·34	·38
27000	49	52	·60	·58	·50	·36	·50		·48		·34	·38
28500	50	53	·62	·60	·52	·38	·52		·48		·34	·40
30000	50	54	·62	·60	·54	·40	·52	·36	·50		·36	·40
31500	50	55	·64	·60	·56	·46	·52	·38	·52		·36	·42
33000	50	56	·64	·62	·58	·50	·54	·42	·54		·36	·42
34500	50	57	·66	·62	·60	·52	·56	·44	·56		·38	·42
36000	50	58	·66	·62	·62	·56	·56	·48	·56	·38	·38	·44
37500	51	59	·68	·64			·58	·50	·58	·42	·38	·44
39000	51	60	·68	·64			·60	·54	·60	·44	·40	·44
40500	51	61	·70	·66			·62	·56	·62	·46	·40	·44

TOPSIDE SCANTLINGS.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 21

(See Continuation.)

PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK.

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THICKNESSES FOR $\frac{1}{2}$ LENGTH AMIDSHIPS.

SECOND LONGITUDINAL NUMERAL. $L \times (B+D)$	BREADTH OF		UPPER DECK.									
					When Two Decks are Fitted.				When Three Steel Decks are Fitted.			
					2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.		Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
42000	51	62	·70	·66			·64	·58	·62	·50	·40	·46
43500	51	63	·72	·68			·64	·62	·64	·52	·42	·46
45000	52	64	·74	·70			·66	·64	·66	·54	·42	·46
46500	52	65	·76	·72			·70	·64	·66	·58	·42	·48
48000	52	66	·78	·74			·72	·66	·68	·62	·42	·48
50000	52	68	·80	·76			·74	·70	·70	·66	·44	·48
52000	53	69	·80	·76			·76	·74	·72	·70	·44	·48
54000	53	70	·82	·78			·78	·78	·76	·74	·44	·48
56000	53	72	·82	·78			·82	·82	·78	·76	·46	·48
58000	54	74	·84	·80			·84	·84	·80	·80	·46	·48
60000	54	76	·84	·80			·88	·88	·82	·82	·46	·48
62000	54	77	·86	·82			·92	·92	·86	·86	·48	·48
64000	55	79	·86	·82			·94	·94	·88	·88	·48	·48
66000	55	80	·88	·84			·98	·98	·92	·92	·48	·48
68000	56	81	·88	·84			1·02	1·02	·96	·96	·48	·48
70000	56	82	·90	·86			1·06	1·06	·98	·98	·50	·50
72000	56	84	·92	·88			1·10	1·10	1·00	1·00	·50	·50
74500	56	86	·92	·88			1·14	1·14	1·04	1·04	·50	·50
77000	57	88	·94	·88			1·18	1·18	1·08	1·08	·52	·52
79500	57	90	·96	·90					1·12	1·12	·52	·52
82000	58	92	·98	·92					1·16	1·16	·52	·52
84500	59	94	1·00	·94					1·20	1·20	·54	·54
87000	60	96	1·02	·96								

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TOPSIDE SCANTLINGS.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 21

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 12									
			THICKNESSES FOR ½ LENGTH AMIDSHIPS.									
					UPPER DECK.							
					When Two Decks are Fitted.				When Three Steel Decks are Fitted.			
					2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.		Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12000	46	45	·44	·44	42×·42	12×·42	·38				·30	·32
13000	46	45	·46	·44	42×·42	12×·42	·38				·30	·32
14000	46	45	·46	·46	43×·42	12×·42	·38				·30	·32
15000	47	45	·48	·46	43×·44	13×·44	·38				·30	·32
16000	47	45	·50	·48	44×·46	14×·46	·40				·30	·32
17000	47	45	·50	·48	45×·46	15×·46	·40				·30	·34
18000	48	45	·52	·50	46×·48	18×·48	·40		·38		·30	·34
19000	48	46	·54	·52	48×·50	25×·50	·42		·40		·30	·34
20000	48	46	·56	·52	51×·50	28×·50	·42		·40		·30	·34
21000	48	47	·56	·54	55×·50	32×·50	·44		·42		·30	·36
22000	48	48	·58	·54	60×·50	35×·50	·44		·42		·32	·36
23000	49	49	·58	·56	·46	·32	·46		·44		·32	·36
24000	49	50	·60	·58	·48	·34	·48		·44		·34	·38
25500	49	51	·62	·58	·52	·36	·50	·30	·46		·34	·38
27000	49	52	·62	·58	·56	·40	·50	·30	·48		·36	·38
28500	50	53	·64	·60	·56	·44	·54	·32	·50		·36	·40
30000	50	54	·64	·60	·58	·48	·58	·36	·54	·36	·36	·40
31500	50	55	·66	·62	·58	·52	·58	·40	·56	·38	·38	·42
33000	50	56	·66	·62	·60	·56	·60	·44	·58	·40	·38	·42
34500	50	57	·68	·64	·64	·62	·60	·46	·60	·42	·38	·42
36000	50	58	·68	·66	·66	·66	·62	·50	·62	·46	·38	·44
37500	51	59	·70	·66			·62	·54	·62	·50	·40	·44
39000	51	60	·70	·66			·64	·58	·64	·52	·40	·44
40500	51	61	·72	·68			·66	·62	·66	·56	·42	·44

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TOPSIDE SCANTLINGS.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 21

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 12									
			THICKNESSES FOR ½ LENGTH AMIDSHIPS.									
					UPPER DECK.							
					When Two Decks are Fitted.				When Three Steel Decks are Fitted.		Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
					2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.			
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
42000	51	62	·72	·68			·68	·66	·68	·60	·42	·46
43500	51	63	·74	·70			·70	·70	·70	·62	·42	·46
45000	52	64	·76	·72			·72	·72	·72	·64	·42	·46
46500	52	65	·78	·74			·76	·76	·74	·68	·44	·48
48000	52	66	·80	·76			·78	·78	·76	·70	·44	·48
50000	52	68	·82	·78			·82	·82	·78	·74	·44	·48
52000	53	69	·84	·78			·84	·84	·78	·78	·44	·48
54000	53	70	·86	·80			·88	·88	·82	·82	·46	·48
56000	53	72	·88	·82			·90	·90	·84	·84	·46	·48
58000	54	74	·90	·82			·94	·94	·88	·88	·46	·48
60000	54	76	·92	·84			·98	·98	·92	·92	·48	·48
62000	54	77	·92	·84			1·04	1·04	·96	·96	·48	·48
64000	55	79	·94	·86			1·08	1·08	1·00	1·00	·48	·48
66000	55	80	·96	·88			1·12	1·12	1·04	1·04	·48	·48
68000	56	81	·98	·90			1·16	1·16	1·06	1·06	·48	·48
70000	56	82	·98	·90			1·20	1·20	1·10	1·10	·50	·50
72000	56	84	1·00	·92					1·12	1·12	·50	·50
74500	56	86	1·00	·92					1·16	1·16	·50	·50
77000	57	88	1·02	·94					1·20	1·20	·52	·52
79500	57	90	1·04	·96								
82000	58	92	1·06	·96								
84500	59	94	1·08	·98								
87000	60	96	1·12	1·00								

TOPSIDE SCANTLINGS.
COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 21
(See Continuation.)

PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK.
13

THICKNESSES FOR $\frac{1}{2}$ LENGTH AMIDSHIPS.

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		UPPER DECK.									
					When Two Decks are Fitted.				When Three Steel Decks are Fitted.			
					2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.		Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12000	46	45	·46	·44	42×·44	12×·44	·40				·30	·32
13000	46	45	·48	·44	43×·44	12×·44	·40				·30	·32
14000	46	45	·50	·46	43×·46	12×·46	·40				·30	·32
15000	47	45	·50	·46	44×·46	13×·46	·42				·30	·32
16000	47	45	·52	·48	44×·48	14×·48	·42				·30	·32
17000	47	45	·52	·48	46×·48	15×·48	·42				·30	·32
18000	48	45	·54	·50	46×·50	18×·50	·42				·30	·34
19000	48	46	·56	·52	50×·50	25×·50	·44		·40		·30	·34
20000	48	46	·58	·52	52×·50	29×·50	·44		·40		·30	·34
21000	48	47	·58	·54	55×·50	33×·50	·46		·42		·30	·34
22000	48	48	·60	·54	·44	·32	·46		·42		·32	·36
23000	49	49	·60	·56	·48	·32	·48		·44		·32	·36
24000	49	50	·62	·58	·50	·34	·50		·46		·34	·36
25500	49	51	·64	·58	·52	·38	·52		·46		·34	·38
27000	49	52	·66	·60	·56	·42	·54		·48		·36	·38
28500	50	53	·68	·62	·56	·46	·54	·36	·52		·36	·38
30000	50	54	·68	·62	·58	·48	·58	·38	·56	·36	·36	·40
31500	50	55	·70	·64	·58	·54	·58	·42	·56	·40	·38	·40
33000	50	56	·70	·64	·60	·60	·60	·46	·58	·44	·38	·42
34500	50	57	·72	·66	·64	·64	·62	·48	·60	·46	·38	·42
36000	50	58	·72	·68	·68	·68	·64	·50	·64	·48	·40	·42
37500	51	59	·74	·68			·66	·54	·66	·52	·40	·44
39000	51	60	·76	·70			·68	·58	·68	·54	·40	·44
40500	51	61	·78	·70			·70	·62	·70	·58	·42	·44

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TOPSIDE SCANTLINGS.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 21

(See Continuation.)

PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK.

13

THICKNESSES FOR $\frac{1}{2}$ LENGTH AMIDSHIPS.

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		Sheerstrake.	Strake below Sheerstrake.	UPPER DECK.							
					When Two Decks are Fitted.				When Three Steel Decks are Fitted.		Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
					2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.			
	Sheerstrake and Strake below.	Stringer Plate.			Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
42000	51	62	·80	·72			·72	·66	·72	·60	·42	·44
43500	51	63	·82	·74			·74	·70	·74	·64	·42	·46
45000	52	64	·84	·76			·76	·72	·76	·68	·42	·46
46500	52	65	·86	·78			·78	·76	·78	·70	·44	·46
48000	52	66	·88	·78			·82	·78	·82	·72	·44	·48
50000	52	68	·90	·80			·84	·84	·84	·76	·44	·48
52000	53	69	·92	·82			·88	·88	·86	·80	·44	·48
54000	53	70	·94	·84			·92	·92	·86	·86	·46	·48
56000	53	72	·96	·86			·94	·94	·88	·88	·46	·48
58000	54	74	·98	·86			·98	·98	·92	·92	·46	·48
60000	54	76	1·00	·88			1·02	1·02	·96	·96	·48	·48
62000	54	77	1·02	·88			1·06	1·06	1·00	1·00	·48	·48
64000	55	79	1·04	·90			1·10	1·10	1·04	1·04	·48	·48
66000	55	80	1·06	·92			1·14	1·14	1·08	1·08	·50	·50
68000	56	81	1·08	·94			1·18	1·18	1·12	1·12	·50	·50
70000	56	82	1·10	·96			1·22	1·22	1·16	1·16	·50	·50
72000	56	84	1·12	·98			1·26	1·26	1·20	1·20	·50	·50
74500	56	86	1·14	1·00			1·30	1·30	1·24	1·24	·52	·52
77000	57	88	1·16	1·00			1·34	1·34	1·28	1·29	·52	·52
79500	57	90	1·18	1·02								
82000	58	92	1·20	1·04								
84500												
87000												

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TOPSIDE SCANTLINGS.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 21

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L×(B+D)	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. 13½ THICKNESSES FOR ½ LENGTH AMIDSHIPS. UPPER DECK.									THICKNESSES AT ENDS.	
					When Two Decks are Fitted.				When Three Steel Decks are Fitted.				
					2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.				
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Tie Plates and Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings	Stringer Plates at Ends of Upper Deck; also thickness of Tie Plates at Ends.	Thickness of Upper Deck Plating at Ends.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12000	46	45	·46	·44	42×·44	12×·44	·40				·30	·32	29×·34	·30
13000	46	45	·48	·44	43×·44	12×·44	·40				·30	·32	30×·34	·30
14000	46	45	·50	·46	44×·46	12×·46	·40				·30	·32	31×·34	·30
15000	47	45	·50	·46	44×·46	13×·46	·42				·30	·32	32×·36	·30
16000	47	45	·52	·48	45×·48	14×·48	·42				·30	·32	33×·36	·30
17000	47	45	·52	·48	46×·50	15×·50	·42				·30	·32	33×·36	·30
18000	48	45	·54	·50	47×·50	18×·50	·42				·30	·34	34×·36	·30
19000	48	46	·56	·52	50×·50	25×·50	·44		·40		·30	·34	34×·38	·30
20000	48	46	·58	·52	52×·50	29×·50	·44		·40		·30	·34	35×·38	·30
21000	48	47	·58	·54	55×·50	33×·50	·46		·42		·30	·34	35×·38	·30
22000	48	48	·60	·54	·44	·32	·46		·42		·32	·36	35×·38	·30
23000	49	49	·60	·56	·48	·32	·48		·44		·32	·36	36×·38	·30
24000	49	50	·62	·58	·50	·34	·50		·46		·34	·36	36×·38	·32
25500	49	51	·64	·58	·54	·38	·52	·36	·46		·34	·38	36×·40	·32
27000	49	52	·66	·60	·56	·42	·54	·36	·48		·36	·38	37×·40	·32
28500	50	53	·68	·62	·56	·46	·54	·36	·52		·36	·38	37×·40	·32
30000	50	54	·68	·62	·58	·48	·58	·38	·56	·36	·36	·40	37×·40	·34
31500	50	55	·70	·64	·58	·54	·58	·42	·58	·40	·38	·40	38×·40	·34
33000	50	56	·70	·64	·60	·60	·60	·46	·60	·44	·38	·42	38×·42	·34
34500	50	57	·72	·66	·64	·64	·64	·48	·62	·46	·38	·42	38×·42	·34
36000	50	58	·74	·68	·68	·68	·66	·50	·66	·48	·40	·42	39×·42	·36
37500	51	59	·76	·68			·68	·54	·68	·52	·40	·44	39×·42	·36
39000	51	60	·78	·70			·70	·58	·70	·54	·40	·44	39×·42	·36
40500	51	61	·80	·70			·72	·62	·72	·58	·42	·44	40×·44	·36

The Thicknesses of the Sheerstrake and of the Strake below the Sheerstrake at the ends of the vessel may be the same as the thickness of the side plating at the ends of the vessel.

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TOPSIDE SCANTLINGS.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 21 *(Concluded.)*

SECOND LONGITUDINAL NUMERAL.	BREADTH OF		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK. $13\frac{1}{2}$								THICKNESSES AT ENDS.	
			THICKNESSES FOR $\frac{1}{2}$ LENGTH AMIDSHIPS.									
					UPPER DECK.							
					When Two Decks are Fitted.				When Three Steel Decks are Fitted.			
					2nd Deck of Stringers and Tie Plates.		2nd Deck of Steel.		2nd and 3rd Decks of Steel.			
$L \times (B+D)$	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake below Sheerstrake.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Deck Plating within Line of Deck Openings	Minimum for Unsheathed Deck Plating abreast Deck Openings	Stringer Plates at Ends of Upper Deck; also thickness of Tie Plates at Ends.	Thickness of Upper Deck Plating at Ends.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
42000	51	62	·82	·72			·74	·66	·74	·60	·42	·44	40 × ·44	·36
43500	51	63	·84	·74			·76	·70	·76	·64	·42	·46	40 × ·44	·36
45000	52	64	·86	·76			·78	·72	·78	·68	·42	·46	41 × ·44	·36
46500	52	65	·88	·78			·80	·76	·80	·70	·44	·46	41 × ·44	·36
48000	52	66	·90	·78			·84	·78	·84	·72	·44	·48	41 × ·44	·36
50000	52	68	·92	·80			·86	·84	·84	·78	·44	·48	42 × ·46	·36
52000	53	69	·94	·82			·88	·88	·86	·82	·44	·48	42 × ·46	·36
54000	53	70	·96	·84			·92	·92	·88	·86	·46	·48	42 × ·46	·38
56000	53	72	·98	·86			·96	·96	·90	·90	·46	·48	43 × ·46	·38
58000	54	74	1·00	·88			1·00	1·00	·94	·94	·46	·48	43 × ·46	·38
60000	54	76	1·02	·90			1·04	1·04	·98	·98	·48	·48	43 × ·46	·38
62000	54	77	1·06	·90			1·08	1·08	1·02	1·02	·48	·48	44 × ·46	·38
64000	55	79	1·08	·92			1·12	1·12	1·06	1·06	·48	·48	44 × ·48	·38
66000	55	80	1·10	·94			1·16	1·16	1·10	1·10	·50	·50	44 × ·48	·38
68000	56	81	1·12	·96			1·20	1·20	1·14	1·14	·50	·50	45 × ·48	·38
70000	56	82	1·14	·98					1·18	1·18	·50	·50	45 × ·48	·38
72000	56	84	1·16	1·00					1·22.	1·22.	·50	·50	45 × ·50	·40
74500	56	86	1·18	1·02					1·26.	1·26	·52	·52.	46 × ·50	·40
77000	57	88	1·20	1·04					1·30	1·30	·52.	·52	46 × ·50	·40
79500	57	90	1·22	1·06									47 × ·50	·40
82000													47 × ·50	·40
84500													48 × ·50	·40
87000													48 × ·50	·40

The Thicknesses of the Sheerstrake and of the Strake below the Sheerstrake at the ends of the vessel may be the same as the thickness of the side plating at the ends of the vessel.

when height of superstructure is less than the standard its length may be increased proportionately

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PARTIAL SUPERSTRUCTURES.

FULL SCANTLING VESSELS.

TABLE 22

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L×(B+D)	PERCENTAGE OF LENGTH OF VESSEL COVERED BY SUPERSTRUCTURES. THICKNESS OF BRIDGE SIDE PLATING.			BREADTH OF STRINGER PLATE.	PROPORTION OF LENGTH OF VESSEL TO DEPTH TO BRIDGE DECK. 10												Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
					PERCENTAGE OF LENGTH OF VESSEL COVERED BY SUPERSTRUCTURES.													
					40				60				80					
					THICKNESS OF "LONG BRIDGE" DECK.													
					When Two Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.		When Two Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.		When Two Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.			
	40	60	80		Stringer Plate.	Tie Plates and Deck Plating.*	Stringer Plate.	Deck Plating.	Stringer Plate.	Tie Plates and Deck Plating.*	Stringer Plate.	Deck Plating.	Stringer Plate.	Tie Plates and Deck Plating.*	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches	Inches.	Inches.
12000	·40	·42	·44	45	42×·36	12×·36			42×·38	12×·38			42×·40	12×·40			·30	·32
13000	·40	·42	·44	45	42×·36	13×·36			42×·38	13×·38			42×·40	13×·40			·30	·32
14000	·40	·42	·44	45	43×·38	13×·38			43×·40	14×·40			43×·42	14×·42			·30	·32
15000	·42	·44	·46	45	44×·38	14×·38			44×·40	15×·40			44×·42	16×·42			·30	·32
16000	·42	·44	·46	45	44×·40	14×·40			45×·42	16×·42			45×·44	18×·44			·30	·32
17000	·44	·46	·48	45	44×·40	19×·40			46×·42	21×·42			47×·44	22×·44			·30	·34
18000	·44	·46	·48	45	44×·42	22×·42	·34		46×·44	23×·44	·36		48×·46	24×·46	·38		·30	·34
19000	·46	·48	·50	46	46×·42	29×·42	·36		48×·44	30×·44	·38		50×·46	31×·46	·40		·30	·34
20000	·46	·48	·50	46	48×·42	34×·42	·36		50×·44	36×·44	·38		52×·46	38×·46	·40		·30	·34
21000	·48	·50	·52	47	50×·44	37×·44	·38		52×·46	39×·46	·40		54×·48	40×·48	·42		·30	·36
22000	·48	·50	·52	48	·40	·32	·38	·32	·42	·32	·40	·32	·44	·32	·42	·32	·32	·36
23000	·50	·52	·54	49	·40	·32	·38	·32	·42	·32	·40	·32	·44	·32	·42	·32	·32	·36
24000	·50	·52	·54	50	·40	·32	·40	·32	·42	·32	·42	·32	·44	·32	·44	·32	·32	·38
25500	·52	·54	·56	51	·42	·32	·40	·32	·44	·32	·42	·32	·46	·32	·44	·32	·32	·38
27000	·52	·54	·56	52	·42	·34	·40	·34	·44	·34	·44	·34	·46	·34	·46	·34	·34	·40
28500	·54	·56	·58	53	·44	·34	·42	·34	·44	·34	·44	·34	·48	·34	·46	·34	·34	·40
30000	·54	·56	·58	54	·44	·34	·42	·34	·46	·36	·46	·34	·48	·36	·48	·34	·34	·40
31500	·56	·58	·60	55	·44	·36	·42	·36	·46	·38	·46	·36	·50	·38	·50	·36	·36	·42
33000	·56	·58	·60	56	·46	·36	·44	·36	·48	·38	·48	·36	·50	·40	·50	·36	·36	·42
34500	·58	·60	·62	57	·48	·36	·46	·36	·50	·40	·48	·38	·52	·42	·52	·38	·36	·42
36000	·58	·60	·62	58	·48	·36	·48	·36	·52	·40	·50	·38	·56	·42	·52	·38	·36	·42
37500	·60	·62	·64	59	·50	·38	·50	·38	·54	·42	·52	·40	·58	·44	·54	·40	·38	·44

* Where a Steel Deck is prescribed to be fitted at the Bridge Deck, the deck below the Bridge Deck is to be a Steel Deck.

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PARTIAL SUPERSTRUCTURES.

FULL SCANTLING VESSELS.

TABLE 22

(See Continuation.)

SECOND LONGITUDINAL NUMERAL. L×(B+D)	PERCENTAGE OF LENGTH OF VESSEL COVERED BY SUPERSTRUCTURES. THICKNESS OF BRIDGE SIDE PLATING.			BREADTH OF STRINGER PLATE.	PROPORTION OF LENGTH OF VESSEL TO DEPTH TO BRIDGE DECK. 10										Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
					PERCENTAGE OF LENGTH OF VESSEL COVERED BY SUPERSTRUCTURES.											
					40				60				80			
					THICKNESS OF "LONG BRIDGE" DECK.											
					When Two Steel Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.		When Two Steel Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.		When Two Steel Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.			
	40	60	80		Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
39000	·60	·62	·64	60	·50	·42	·50	·40	·54	·46	·52	·40	·58	·48	·54	·40	·38	·44
40500	·62	·64	·66	61	·54	·44	·52	·40	·56	·48	·54	·42	·60	·52	·56	·42	·40	·44
42000	·62	·64	·66	62	·56	·48	·54	·40	·58	·52	·56	·42	·60	·54	·60	·44	·40	·46
43500	·62	·64	·66	63			·54	·42			·56	·44			·60	·46	·42	·46
45000	·64	·66	·68	64			·58	·42			·60	·46			·62	·48	·42	·46
46500	·64	·66	·68	65			·58	·44			·60	·48			·62	·52	·42	·46
48000	·66	·68	·70	66			·60	·46			·62	·50			·64	·54	·42	·48
50000	·66	·68	·70	68			·60	·50			·62	·54			·64	·56	·44	·48
52000	·68	·70	·72	69			·62	·54			·64	·58			·66	·60	·44	·48
54000	·68	·70	·72	70			·62	·58			·66	·62			·68	·64	·44	·48
56000	·68	·72	·74	72			·64	·62			·66	·66			·68	·68	·46	·48
58000	·68	·72	·74	74			·66	·66			·70	·70			·72	·72	·46	·48
60000	·70	·74	·76	76			·70	·70			·72	·72			·74	·74	·46	·48
62000	·70	·74	·76	78			·74	·74			·76	·76			·78	·78	·48	·48
64000	·72	·76	·78	79			·76	·76			·80	·80			·82	·82	·48	·48
66000	·72	·76	·78	80			·80	·80			·84	·84			·86	·86	·48	·48
68000	·74	·78	·80	81			·84	·84			·86	·86			·88	·88	·48	·48
70000	·74	·78	·80	83			·86	·86			·90	·90			·92	·92	·50	·50
72000	·76	·80	·82	85			·90	·90			·92	·92			·94	·94	·50	·50
74000	·76	·80	·84	86			·92	·92			·94	·94			·96	·96	·50	·50
76000	·78	·82	·86	88			·94	·94			·98	·98			1·00	1·00	·50	·50

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PARTIAL SUPERSTRUCTURES.

FULL SCANTLING VESSELS.

TABLE 22

(See Continuation.)

PROPORTION OF LENGTH OF VESSEL TO DEPTH TO BRIDGE DECK.

11

SECOND LONGITUDINAL NUMERAL. L×(B+D) 11	PERCENTAGE OF LENGTH OF VESSEL COVERED BY SUPERSTRUCTURES. THICKNESS OF BRIDGE SIDE PLATING.			BREADTH OF STRINGER PLATE.	PERCENTAGE OF LENGTH OF VESSEL COVERED BY SUPERSTRUCTURES. THICKNESS OF "LONG BRIDGE" DECK.										Deck Plating within Line of Deck Openings	Minimum for Unsheathed Deck Plating abreast Deck Openings
	40	60	80		40				60				80			
					When Two Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.		When Two Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.		When Two Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.			
					Stringer Plate.	Tie Plates and Deck Plating.*	Stringer Plate.	Deck Plating.	Stringer Plate.	Tie Plates and Deck Plating.*	Stringer Plate.	Deck Plating.	Stringer Plate.	Tie Plates and Deck Plating.*	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12000	·40	·42	·44	45	42×·38	12×·38			42×·40	12×·40			42×·42	12×·42			·30	·32
13000	·40	·42	·44	45	42×·38	14×·38			42×·40	14×·40			42×·42	14×·42			·30	·32
14000	·40	·42	·44	45	43×·38	16×·38			43×·40	16×·40			43×·42	16×·42			·30	·32
15000	·42	·44	·46	45	44×·40	16×·40			45×·42	17×·42			45×·44	18×·44			·30	·32
16000	·42	·44	·46	45	44×·40	19×·40			46×·42	22×·42			47×·44	24×·44			·30	·32
17000	·44	·46	·48	45	47×·42	22×·42			49×·44	24×·44			51×·46	26×·46			·30	·34
18000	·44	·46	·48	45	50×·42	27×·42	·36		52×·44	29×·44	·36		54×·46	31×·46	·38		·30	·34
19000	·46	·48	·50	46	52×·44	31×·44	·36		52×·46	36×·46	·38		56×·48	35×·48	·40		·30	·34
20000	·46	·48	·50	46	54×·44	38×·44	·36		56×·46	39×·46	·38		58×·48	40×·48	·40		·30	·34
21000	·48	·50	·52	47	·42	·30	·38	·30	·44	·30	·40	·30	·44	·30	·42	·30	·30	·36
22000	·48	·50	·52	48	·42	·32	·38	·32	·44	·32	·40	·32	·44	·32	·42	·32	·32	·36
23000	·50	·52	·54	49	·44	·32	·40	·32	·44	·32	·42	·32	·46	·32	·44	·32	·32	·36
24000	·50	·52	·54	50	·44	·32	·42	·32	·46	·32	·42	·32	·48	·32	·44	·32	·32	·38
25500	·52	·54	·56	51	·46	·34	·42	·34	·48	·34	·44	·34	·50	·34	·46	·34	·32	·38
27000	·52	·54	·56	52	·46	·34	·44	·34	·48	·36	·46	·34	·50	·36	·48	·34	·34	·40
28500	·54	·56	·58	53	·48	·34	·44	·34	·50	·36	·46	·34	·52	·38	·48	·34	·34	·40
30000	·54	·56	·58	54	·48	·36	·44	·36	·50	·38	·48	·36	·52	·42	·50	·36	·34	·40
31500	·56	·58	·60	55	·50	·36	·46	·36	·52	·40	·50	·36	·54	·44	·52	·36	·36	·42
33000	·56	·58	·60	56	·52	·38	·48	·36	·54	·44	·52	·38	·54	·48	·54	·38	·36	·42
34500	·58	·60	·62	57	·54	·42	·48	·38	·56	·46	·52	·38	·56	·50	·56	·40	·36	·42
36000	·58	·60	·62	58	·54	·46	·48	·38	·56	·50	·52	·40	·56	·54	·56	·42	·36	·42
37500	·60	·62	·64	59	·56	·50	·50	·38	·58	·54	·54	·42	·58	·56	·58	·44	·38	·44

* Where a Steel Deck is prescribed to be fitted at the Bridge Deck, the deck below the Bridge Deck is to be a Steel Deck.

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PARTIAL SUPERSTRUCTURES.

FULL SCANTLING VESSELS.

TABLE 22 *(Concluded.)*

SECOND LONGITUDINAL NUMERAL. $L \times (B+D)$	PERCENTAGE OF LENGTH OF VESSEL COVERED BY SUPERSTRUCTURES. 40	60	80	BREADTH OF STRINGER PLATE.	PROPORTION OF LENGTH OF VESSEL TO DEPTH TO BRIDGE DECK. 11												Deck Plating within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
					PERCENTAGE OF LENGTH OF VESSEL COVERED BY SUPERSTRUCTURES.													
					40				60				80					
	THICKNESS OF BRIDGE SIDE PLATING.				THICKNESS OF "LONG BRIDGE" DECK.													
					When Two Steel Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.		When Two Steel Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.		When Two Steel Decks are Fitted including Bridge Deck.		When Three Steel Decks are Fitted including Bridge Deck.			
					Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
32500	.60	.62	.64	59	56	50	50	38	58	54	54	42	58	56	58	46	38	44
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
39000	·60	·62	·64	60	·56	·54	·54	·40	·60	·56	·56	·44	·60	·58	·58	·48	·38	·44
40500	·62	·64	·66	61	·58	·56	·56	·44	·60	·60	·58	·48	·62	·62	·60	·50	·40	·44
42000	·62	·64	·66	62	·60	·60	·56	·46	·62	·62	·58	·50	·64	·64	·60	·54	·40	·46
43500	·62	·64	·66	63			·56	·50			·58	·54			·60	·58	·42	·46
45000	·64	·66	·68	64			·58	·52			·60	·58			·62	·62	·42	·46
46500	·64	·66	·68	65			·58	·56			·62	·62			·66	·66	·42	·46
48000	·66	·68	·70	66			·62	·58			·66	·64			·70	·70	·42	·48
50000	·66	·68	·70	68			·64	·64			·70	·70			·74	·74	·44	·48
52000	·68	·70	·72	69			·66	·66			·72	·72			·76	·76	100 80 ·44	·48
54000	·68	·70	·72	70			·70	·70			·76	·76			·80	·80	84 ·44	·48
56000	·68	·72	·74	72			·74	·74			·78	·78			·82	·82	·46	·48
58000	·68	·72	·74	74			·78	·78			·82	·82			·86	·86	·46	·48
60000	·70	·74	·76	76			·80	·80			·84	·84			·88	·88	·46	·48
62000	·70	·74	·76	78			·84	·84			·88	·88			·92	·92	·48	·48
64000	·72	·76	·78	79			·88	·88			·92	·92			·94	·94	·48	·48
66000	·72	·76	·78	80			·92	·92			·96	·96			·98	·98	·48	·48
68000	·74	·78	·80	81			·94	·94			·98	·98			1·00	1·00	·48	·48
70000	·74	·78	·80	83			·98	·98			1·02	1·02			1·04	1·04	·50	·50
72000	·76	·80	·82	85			1·02	1·02			1·06	1·06			1·08	1·08	·50	·50
74000	·76	·80	·84	86			1·06	1·06			1·10	1·10			1·12	1·12	·50	·50
76000	·78	·82	·86	88			1·08	1·08			1·12	1·12			1·16	1·16	·50	·50

PARTIAL SUPERSTRUCTURES.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 23

(See Continuation.)

SECOND LONGITUDINAL NUMERAL $L \times (B+D)$	THICKNESS OF BRIDGE SIDE PLATING.	BREADTH OF STRINGER PLATE.	PROPORTION OF LENGTH OF VESSEL TO DEPTH TO BRIDGE DECK. 10 — THICKNESS OF "LONG" BRIDGE DECK.							
			When Two Decks are Fitted Including Bridge Deck.		When Three Steel Decks are Fitted Including Bridge Deck.		When Four Steel Decks are Fitted Including Bridge Deck.		Deck Plating Within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
			Stringer Plate.	Tie Plates and Deck Plating.*	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12000	·38	45	42 × ·36	12 × ·36					·30	·32
13000	·38	45	42 × ·36	12 × ·36					·30	·32
14000	·38	45	42 × ·36	13 × ·36					·30	·32
15000	·40	45	42 × ·38	14 × ·38					·30	·32
16000	·40	45	43 × ·40	14 × ·40					·30	·32
17000	·40	45	44 × ·40	16 × ·40					·30	·34
18000	·42	45	45 × ·42	17 × ·42	·34				·30	·34
19000	·42	46	46 × ·42	20 × ·42	·34				·30	·34
20000	·42	46	48 × ·42	24 × ·42	·34				·30	·34
21000	·44	47	50 × ·42	30 × ·42	·36				·30	·36
22000	·44	48	50 × ·42	36 × ·42	·36				·32	·36
23000	·44	49	·36	·32	·36	·32			·32	·36
24000	·46	50	·38	·32	·36	·32			·32	·38
25500	·46	51	·38	·32	·38	·32			·32	·38
27000	·46	52	·38	·34	·38	·34			·34	·40
28500	·48	53	·40	·34	·38	·34			·34	·40
30000	·48	54	·40	·34	·40	·34			·34	·40
31500	·50	55	·40	·36	·40	·36			·36	·42
33000	·50	56	·42	·36	·40	·36			·36	·42
34500	·52	57	·42	·36	·42	·36			·36	·42
36000	·52	58	·44	·36	·42	·36			·36	·42
37500	·52	59	·44	·38	·44	·38			·38	·44
39000	·54	60	·46	·38	·44	·38			·38	·44
40500	·54	61	·46	·40	·46	·40	·46	·40	·40	·44

* Where a Steel Deck is prescribed to be fitted at the Bridge Deck, the deck below the Bridge Deck is to be a Steel Deck.

PARTIAL SUPERSTRUCTURES.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 23

(See Continuation.)

SECOND LONGITUDINAL NUMERAL $L \times (B+D)$	THICKNESS OF BRIDGE SIDE PLATING.	BREADTH OF STRINGER PLATE.	PROPORTION OF LENGTH OF VESSEL TO DEPTH TO BRIDGE DECK. 10 — THICKNESS OF "LONG" BRIDGE DECK.							
			When Two Steel Decks are Fitted Including Bridge Deck.		When Three Steel Decks are Fitted Including Bridge Deck.		When Four Steel Decks are Fitted Including Bridge Deck.		Deck Plating Within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
			Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
42000	·56	62	·46	·40	·46	·40	·46	·40	·40	·46
43500	·56	63			·48	·42	·46	·42	·42	·46
45000	·56	64			·48	·42	·48	·42	·42	·46
46500	·58	65			·50	·42	·48	·42	·42	·46
48000	·58	66			·50	·42	·50	·42	·42	·48
50000	·60	68			·52	·44	·50	·44	·44	·48
52000	·60	69			·54	·44	·52	·44	·44	·48
54000	·62	70			·56	·44	·52	·44	·44	·48
56000	·62	72			·56	·48	·54	·46	·46	·48
58000	·64	74			·58	·52	·56	·50	·46	·48
60000	·64	76			·60	·56	·58	·52	·46	·48
62000	·66	77			·62	·58	·60	·54	·48	·48
64000	·66	79			·62	·62	·60	·58	·48	·48
66000	·68	80			·64	·64	·60	·60	·48	·48
68000	·68	81			·68	·68	·64	·64	·48	·48
70000	·70	83			·72	·72	·68	·68	·50	·50
72000	·70	85			·76	·76	·72	·72	·50	·50
74000	·72	86			·80	·80	·76	·76	·50	·50
76000	·72	88			·84	·84	·80	·80	·50	·50
78000	·74	89			·88	·88	·84	·84	·52	·52
80000	·74	90			·92	·92	·88	·88	·52	·52
82000	·76	92			·96	·96	·92	·92	·52	·52
84500	·76	94			1·00	1·00	·96	·96	·54	·54
87000	·76	96			1·04	1·04	1·00	1·00	·54	·54

PARTIAL SUPERSTRUCTURES.

COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 23

(See Continuation.)

SECOND LONGITUDINAL NUMERAL $L \times (B+D)$	THICKNESS OF BRIDGE SIDE PLATING.	BREADTH OF STRINGER PLATE.	PROPORTION OF LENGTH OF VESSEL TO DEPTH TO BRIDGE DECK. 11 — THICKNESS OF "LONG" BRIDGE DECK.							
			When Two Decks are Fitted Including Bridge Deck.		When Three Steel Decks are Fitted Including Bridge Deck.		When Four Steel Decks are Fitted Including Bridge Deck.		Deck Plating Within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
			Stringer Plate.	Tie Plates and Deck Plating.*	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12000	·38	45	42 × ·36	12 × ·36					·30	·32
13000	·38	45	42 × ·36	13 × ·36					·30	·32
14000	·38	45	42 × ·36	14 × ·36					·30	·32
15000	·40	45	42 × ·38	15 × ·38					·30	·32
16000	·40	45	43 × ·40	17 × ·40					·30	·32
17000	·40	45	45 × ·40	20 × ·40					·30	·34
18000	·42	45	45 × ·42	24 × ·42	·34				·30	·34
19000	·42	46	48 × ·42	28 × ·42	·34				·30	·34
20000	·42	46	50 × ·42	32 × ·42	·34				·30	·34
21000	·44	47	52 × ·42	36 × ·42	·36				·30	·36
22000	·44	48	·38	·32	·36	·32			·32	·36
23000	·44	49	·38	·32	·36	·32			·32	·36
24000	·46	50	·40	·32	·36	·32			·32	·38
25500	·46	51	·40	·32	·38	·32			·32	·38
27000	·46	52	·40	·34	·38	·34			·34	·40
28500	·48	53	·42	·34	·40	·34			·34	·40
30000	·48	54	·42	·36	·40	·36			·36	·40
31500	·50	55	·42	·36	·40	·36			·36	·42
33000	·50	56	·44	·36	·42	·36			·36	·42
34500	·52	57	·44	·36	·42	·36			·36	·42
36000	·52	58	·44	·38	·44	·38			·36	·42
37500	·52	59	·46	·38	·44	·38			·38	·44
39000	·54	60	·46	·38	·46	·38			·38	·44
40500	·54	61	·46	·40	·46	·40	·46	·40	·40	·44

* Where a Steel Deck is prescribed to be fitted at the Bridge Deck, the deck below the Bridge Deck is to be a Steel Deck.

PARTIAL SUPERSTRUCTURES.
COMPLETE SUPERSTRUCTURE VESSELS.

TABLE 23 *(Concluded.)*

SECOND LONGITUDINAL NUMERAL $L \times (B+D)$	THICKNESS OF BRIDGE SIDE PLATING.	BREADTH OF STRINGER PLATE.	PROPORTION OF LENGTH OF VESSEL TO DEPTH TO BRIDGE DECK. 11 — THICKNESS OF "LONG" BRIDGE DECK.							
			When Two Steel Decks are Fitted Including Bridge Deck.		When Three Steel Decks are Fitted Including Bridge Deck.		When Four Steel Decks are Fitted Including Bridge Deck.		Deck Plating Within Line of Deck Openings.	Minimum for Unsheathed Deck Plating abreast Deck Openings
			Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
42000	·56	62	·48	·40	·48	·40	·46	·40	·40	·46
43500	·56	63			·48	·42	·48	·42	·42	·46
45000	·56	64			·48	·42	·48	·42	·42	·46
46500	·58	65			·50	·42	·50	·42	·42	·46
48000	·58	66			·52	·42	·50	·42	·42	·48
50000	·60	68			·54	·44	·52	·44	·44	·48
52000	·60	69			·58	·48	·54	·46	·44	·48
54000	·62	70			·60	·50	·56	·48	·44	·48
56000	·62	72			·60	·54	·56	·52	·46	·48
58000	·64	74			·60	·58	·58	·54	·46	·48
60000	·64	76			·62	·62	·60	·56	·46	·48
62000	·66	77			·64	·64	·60	·60	·48	·48
64000	·66	79			·68	·68	·64	·64	·48	·48
66000	·68	80			·72	·72	·68	·68	·48	·48
68000	·68	81			·76	·76	·72	·72	·48	·48
70000	·70	83			·80	·80	·76	·76	·50	·50
72000	·70	85			·84	·84	·80	·80	·50	·50
74000	·72	86			·88	·88	·84	·84	·50	·50
76000	·72	88			·94	·94	·90	·90	·50	·50
78000	·74	89			1·02	1·02	·98	·98	·52	·52
80000	·74	90			1·08	1·08	1·04	1·04	·52	·52
82000	·76	92					1·12	1·12	·52	·52
84500	·76	94					1·22	1·22	·54	·54
87000	·76	96							·54	·54

TABLE 24

STRINGER ANGLES on UPPER DECKS and LONG BRIDGES.

STRINGER ANGLES.				
THICKNESS OF SHEERSTRAKE OR STRINGER WHICHEVER IS THE GREATER.			DIAMETER OF RIVET AS REQUIRED BY TABLE 38.	SIZES OF FLANGES.*
Above	Inches. and	not exceeding	Inches.	Inches.
—	and	·36	$\frac{5}{8}$	3 × 3
·36	„	·50	$\frac{3}{4}$	$3\frac{1}{2}$ × $3\frac{1}{2}$
50	„	·64	$\frac{7}{8}$	5 × 5
·64	„	·72	$\frac{7}{8}$	6 × 6
·72	„	·96	1	6 × 6
·96	„	1·14	$1\frac{1}{8}$	7 × 7
1·14	„	1·20	$1\frac{1}{4}$	8 × 8

* The thickness of the Gunwale Angle may be that of the Sheerstrake or Stringer Plate, whichever is the less.

LLOYD'S REGISTER OF SHIPPING, LONDON.—17*th May*, 1928.

"SHORT" SUPERSTRUCTURES. TABLE 25

SECOND LONGITUDINAL NUMERAL. L×(B+D)	"SHORT" SUPERSTRUCTURES.											
	POOPS.				"SHORT" BRIDGES.				FORECASTLES.			
	Thickness of Side Plating.	Stringer Angle.	Thickness.		Thickness of Side Plating.	Stringer Angle.	Thickness.		Thickness of Side Plating.	Stringer Angle.	Thickness.	
			Stringer Plate.	Tie Plates.			Stringer Plate.	Tie Plates and Deck Plating.			Stringer Plate.	Tie Plates and Deck Plating.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1500	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	10×·22	5×·22	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	14×·22	5×·22	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	10×·22	5×·22
2000	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	11×·22	5×·22	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	16×·22	5×·22	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	11×·22	5×·22
2500	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	11×·22	5×·22	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	18×·22	5×·22	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	11×·22	5×·22
3000	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	12×·22	6×·22	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	20×·22	6×·22	·22	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot22$	12×·22	6×·22
3700	·24	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot24$	13×·24	6×·24	·24	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot24$	22×·24	6×·24	·24	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot24$	13×·24	6×·24
4400	·24	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot24$	13×·24	6×·24	·24	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot24$	24×·24	6×·24	·24	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot24$	13×·24	6×·24
5200	·24	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot24$	14×·24	6×·24	·24	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot24$	26×·24	6×·24	·24	$2\frac{1}{2}\times2\frac{1}{2}\times\cdot24$	14×·24	6×·24
6100	·24	3 ×3 ×·24	15×·24	6×·24	·24	3 ×3 ×·24	28×·24	6×·24	·24	3 ×3 ×·24	15×·24	6×·24
7100	·26	3 ×3 ×·26	16×·26	7×·26	·26	3 ×3 ×·26	30×·26	7×·26	·26	3 ×3 ×·26	16×·26	7×·26
8200	·26	3 ×3 ×·26	17×·26	7×·26	·26	3 ×3 ×·26	31×·26	7×·26	·26	3 ×3 ×·26	17×·26	7×·26
9600	·26	3 ×3 ×·26	18×·26	7×·26	·28	3 ×3 ×·28	32×·28	7×·28	·28	3 ×3 ×·28	18×·28	7×·28
11000	·28	3 ×3 ×·28	20×·28	7×·28	·30	3 ×3 ×·30	33×·30	7×·30	·30	3 ×3 ×·30	20×·30	7×·30
12600	·28	3 ×3 ×·28	22×·28	7×·28	·30	3 ×3 ×·30	33×·30	7×·30	·30	3 ×3 ×·30	22×·30	7×·30
14600	·30	3 ×3 ×·30	24×·30	8×·30	·32	3 ×3 ×·32	34×·32	8×·32	·32	3 ×3 ×·30	24×·30	Dk. Pltg. ·30
17000	·32	3 ×3 ×·30	26×·30	8×·30	·34	3 ×3 ×·34	35×·34	8×·34	·34	3 ×3 ×·32	26×·32	·30
19500	·34	3 ×3 ×·32	28×·32	8×·32	·36	3 ×3 ×·36	36×·36	8×·36	·36	3 ×3 ×·32	28×·32	·30
22200	·34	3 ×3 ×·32	30×·32	8×·32	·38	3 ×3 ×·38	37×·38	9×·38	·38	3 ×3 ×·32	30×·32	·32
25000	·36	3 ×3 ×·32	32×·32	9×·32	·38	3 ×3 ×·38	38×·38	9×·38	·38	3 ×3 ×·32	32×·32	·32
27800	·36	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot34$	33×·34	9×·34	·40	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	38×·40	Dk. Pltg. ·30	·40	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot34$	33×·34	·32
30600	·38	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot34$	34×·34	9×·34	·40	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	39×·40	·30	·40	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot34$	34×·34	·34
33400	·38	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot34$	35×·34	9×·34	·40	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	39×·40	·32	·40	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot34$	34×·34	·34
36200	·38	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot36$	36×·36	9×·36	·42	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	40×·42	·32	·42	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot36$	35×·36	·34
39000	·40	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot36$	37×·36	9×·36	·42	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	41×·42	·32	·42	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot36$	35×·36	·34
41800	·40	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot36$	37×·36	10×·36	·42	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	41×·42	·34	·42	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot36$	35×·36	·36
44600	·40	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	38×·38	10×·38	·44	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	42×·44	·34	·44	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	36×·38	·36
47400	·42	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	39×·38	10×·38	·44	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	43×·44	·34	·44	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	36×·38	·36
50200	·42	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	39×·38	10×·38	·44	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	43×·44	·36	·44	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	36×·38	·36
53000	·42	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	40×·40	10×·40	·46	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	44×·46	·36	·46	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	37×·40	·36
55800	·42	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	41×·40	10×·40	·46	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	45×·46	·38	·46	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	37×·40	·38
58600	·44	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	41×·40	11×·40	·46	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	45×·46	·38	·46	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	37×·40	·38
61400	·44	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	42×·40	11×·40	·48	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	46×·48	38	·48	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	37×·40	·38
64200	·44	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	43×·42	11×·42	·48	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	47×·48	·38	·48	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	38×·42	·38
67000	·46	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	43×·42	11×·42	·48	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	47×·48	·38	·48	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	38×·42	·38
69800	·46	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	44×·42	11×·42	·50	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	48×·50	·38	·50	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	38×·42	·38
72600	·46	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	44×·42	11×·42	·50	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	49×·50	·40	·50	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	38×·42	·40
75400	·46	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	45×·44	12×·44	·50	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	49×·50	·40	·50	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	39×·44	·40
78200	·48	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	46×·44	12×·44	·52	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	50×·52	·40	·52	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	39×·44	·40
81000	·48	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	46×·44	12×·44	·52	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	51×·52	·40	·52	$3\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	40×·44	·40

Lower dks Below 2nd deck
Inside line of openings as
per Table 26 at ends I 15

LOWER DECKS. TABLE 26

SECOND LONGITUDINAL NUMERAL. $L \times (B+D)$.	ALL LOWER DECKS.	SECOND DECK WHERE A STEEL DECK IS FITTED.			SECOND DECK WHERE STRINGERS AND TIES ARE FITTED.		THIRD DECK.		DECKS BELOW THIRD DECK.		ALL LOWER DECKS.			
		HALF LENGTH AMIDSHIPS.									STRINGER ANGLE.			
	Breadth of Stringer Plate for ½-Length Amidships.	Thickness.			Thickness of Stringer Plate.	Tie Plates.	Thickness.		Thickness.		Half Length Amidships.	At Ends.	Stringer Plates at Ends also Thickness of Tie Plates at Ends.	Thickness of Deck Plating at Ends.
		Stringer Plate.	Deck Plating abreast Line of Openings.	Deck Plating Inside Line of Openings.			Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.				
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
9000	41				·34	9 × ·34					3 × 3 × ·34	·34	24 × ·34	
10500	41				·34	9 × ·34					3 × 3 × ·34	·34	25 × ·34	
12100	42	·34	·30	·30	·36	10 × ·36					3 × 3 × ·34	·34	26 × ·34	·30
13800	42	·34	·30	·30	·36	10 × ·36					3 × 3 × ·34	·34	27 × ·34	·30
15700	43	·34	·30	·30	·38	11 × ·38					3 × 3 × ·34	·34	28 × ·34	·30
17700	43	·34	·30	·30	·40	12 × ·40					3½ × 3½ × ·34	·34	29 × ·34	·30
19800	44	·34	·30	·30	·42	13 × ·42	·34	·30			3½ × 3½ × ·36	·34	30 × ·34	·30
22100	44	·34	·30	·30	·42	13 × ·42	·34	·30			3½ × 3½ × ·36	·34	31 × ·34	·30
24500	45	·36	·32	·30	·44	14 × ·44	·34	·30			3½ × 3½ × ·36	·34	32 × ·34	·30
27000	45	·36	·32	·32	·44	14 × ·44	·34	·30	·34	·30	3½ × 3½ × ·38	·34	33 × ·34	·30
29600	46	·38	·34	·32	·46	15 × ·46	·36	·32	·34	·30	3½ × 3½ × ·38	·34	34 × ·34	·30
32400	47	·38	·34	·32	·46	15 × ·46	·36	·32	·34	·30	3½ × 3½ × ·40	·34	35 × ·34	·30
35300	47	·40	·36	·34			·36	·32	·34	·30	3½ × 3½ × ·40	·34	35 × ·34	·30
38300	48	·40	·36	·34			·38	·34	·36	·32	3½ × 3½ × ·42	·34	36 × ·34	·30
41400	49	·42	·38	·34			·38	·34	·36	·32	3½ × 3½ × ·44	·36	37 × ·36	·32
44600	50	·44	·40	·34			·38	·34	·36	·32	3½ × 3½ × ·44	·36	38 × ·36	·32
47800	51	·46	·42	·36			·40	·36	·38	·34	3½ × 3½ × ·46	·36	39 × ·36	·32
51000	51	·46	·42	·36			·40	·36	·38	·34	3½ × 3½ × ·46	·36	39 × ·36	·32
54200	52	·48	·44	·36			·40	·36	·38	·34	3½ × 3½ × ·48	·36	40 × ·36	·32
57400	53	·48	·44	·36			·42	·38	·40	·36	3½ × 3½ × ·48	·38	41 × ·38	·34
60600	54	·50	·46	·38			·42	·38	·40	·36	3½ × 3½ × ·50	·38	41 × ·38	·34
63800	54	·50	·46	·38			·44	·40	·40	·36	3½ × 3½ × ·50	·38	42 × ·38	·34
67000	55	·52	·48	·40			·44	·40	·40	·36	3½ × 3½ × ·52	·38	43 × ·38	·34
70400	56	·52	·48	·40			·46	·42	·42	·38	3½ × 3½ × ·52	·40	43 × ·40	·36
74000	57	·54	·50	·40			·46	·42	·42	·38	3½ × 3½ × ·54	·40	44 × ·40	·36
77700	57	·54	·50	·40			·48	·44	·44	·40	4 × 4 × ·54	·40	45 × ·40	·36
81400	58	·56	·52	·42			·48	·44	·44	·40	4 × 4 × ·56	·40	45 × ·40	·36
85200	58	·56	·52	·42			·50	·46	·46	·42	4 × 4 × ·56	·42	46 × ·42	·38
89100	59	·58	·54	·42			·50	·46	·46	·42	4 × 4 × ·58	·42	47 × ·42	·38
93100	59	·58	·54	·42			·52	·48	·46	·42	4 × 4 × ·58	·42	47 × ·42	·38
96200	60	·60	·56	·44			·52	·48	·48	·44	4 × 4 × ·60	·42	48 × ·42	·38

In way of a partial superstructure exceeding 15 per cent. of the vessel's length, the thickness of the second deck may be as required for a third deck, and the thickness of the third deck may be as required for decks below third deck.

BULKHEAD STIFFENERS spaced 30 INCHES apart and fitted with BRACKET ATTACHMENTS at top and bottom in accordance with Table 30.

TABLE 27

(See Continuation.)

Overall Length of Stiffener, including End Attachments.		HEIGHT OF TOP OF BULKHEAD AT MIDDLE LINE ABOVE TOP OF STIFFENER.						
		Feet. 0	Feet. 2	Feet. 4	Feet. 6	Feet. 8	Feet. 10	Feet. 12
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
8	ANGLES	4 × 3 × ·30	4½ × 3 × ·30	4½ × 3 × ·34	5 × 3 × ·32	5½ × 3 × ·32	5½ × 3 × ·36	6 × 3 × ·34
9	ANGLES	4½ × 3 × ·32	5 × 3 × ·32	5 × 3 × ·36	5½ × 3 × ·36	6 × 3 × ·36	6 × 3 × ·38	5½ × 3 × ·30
10	ANGLES	5 × 3 × ·34	5½ × 3 × ·34	6 × 3 × ·34	6 × 3 × ·38	5½ × 3 × ·30	6 × 3 × ·32	6 × 3 × ·34
11	ANGLES	5½ × 3 × ·36	6 × 3 × ·36	5½ × 3 × ·30	5½ × 3 × ·36	6 × 3 × ·32	6½ × 3 × ·34	6½ × 3 × ·36
12	ANGLES	6 × 3 × ·38	5½ × 3 × ·32	6 × 3 × ·32	6 × 3 × ·36	6½ × 3 × ·36	7 × 3 × ·36	7 × 3 × ·38
13	BULB ANGLES	5½ × 3 × ·34	6 × 3 × ·34	6½ × 3 × ·34	6½ × 3 × ·38	7 × 3 × ·38	7½ × 3 × ·38	7½ × 3 × ·40
14	BULB ANGLES	6 × 3 × ·34	6½ × 3 × ·34	7 × 3 × ·36	7 × 3 × ·40	7½ × 3 × ·40	8 × 3 × ·40	8 × 3 × ·44
15	BULB ANGLES	6½ × 3 × ·34	7 × 3 × ·36	7½ × 3 × ·38	7½ × 3 × ·42	8 × 3 × ·42	8½ × 3 × ·42	8½ × 3 × ·46
16	BULB ANGLES	7 × 3 × ·36	7½ × 3 × ·38	8 × 3 × ·40	8 × 3 × ·44	8½ × 3 × ·44	9 × 3 × ·44	9 × 3 × ·48
17	BULB ANGLES	7½ × 3 × ·38	8 × 3 × ·40	8½ × 3 × ·42	8½ × 3 × ·46	9 × 3 × ·46	9½ × 3½ × ·46	9½ × 3½ × ·48
18	BULB ANGLES	8 × 3 × ·40	8½ × 3 × ·42	9 × 3 × ·44	9 × 3 × ·48	9½ × 3½ × ·46	10 × 3½ × ·46	10½ × 3½ × ·46
19	BULB ANGLES	8½ × 3 × ·42	9 × 3 × ·44	9 × 3 × ·50	9½ × 3½ × ·48	10 × 3½ × ·48	10½ × 3½ × ·48	11 × 3½ × ·48
20	BULB ANGLES	9 × 3 × ·44	9½ × 3½ × ·46	10 × 3½ × ·46	10½ × 3½ × ·50	10½ × 3½ × ·52	11 × 3½ × ·48	11½ × 3½ × ·50
21	BULB ANGLES	9½ × 3½ × ·46	10 × 3½ × ·46	10½ × 3½ × ·46	11 × 3½ × ·48	11 × 3½ × ·50	11½ × 3½ × ·52	12 × 3½ × ·52
22	BULB ANGLES	10 × 3½ × ·46	10½ × 3½ × ·46	11 × 3½ × ·48	11½ × 3½ × ·48	12 × 3½ × ·50	12 × 3½ × ·54	12 × 3½ × 3½ × ·46
23	BULB ANGLES	10½ × 3½ × ·46	11 × 3½ × ·48	11½ × 3½ × ·48	12 × 3½ × ·50	12 × 3½ × ·56	12 × 3½ × 3½ × ·46	12 × 3½ × 3½ × ·56
24	BULB ANGLES	11 × 3½ × ·48	11½ × 3½ × ·48	12 × 3½ × ·50	12 × 3½ × 3½ × ·46	12 × 3½ × 3½ × ·50	12 × 4 × 4 × ·48	12 × 4 × 4 × ·54
25	BULB ANGLES	11½ × 3½ × ·48	12 × 3½ × ·50	12 × 3½ × 3½ × ·46	12 × 3½ × 3½ × ·54	12 × 4 × 4 × ·50	13 × 4 × 4 × ·48	13 × 4 × 4 × ·52
26	BULB ANGLES	12 × 3½ × ·50	12 × 3½ × 3½ × ·46	12 × 3½ × 3½ × ·54	12 × 4 × 4 × ·54	13 × 4 × 4 × ·50	13 × 4 × 4 × ·56	
27	CHANNELS	12 × 3½ × 3½ × ·46	12 × 3½ × 3½ × ·50	12 × 4 × 4 × ·50	13 × 4 × 4 × ·54	14 × 4 × 4 × ·50		

BULKHEAD STIFFENERS spaced 30 INCHES apart and fitted with BRACKET ATTACHMENTS at top and bottom in accordance with Table 30.

TABLE 27

(See Continuation.)

Overall Length of Stiffener, including End Attachments.		HEIGHT OF TOP OF BULKHEAD AT MIDDLE LINE ABOVE TOP OF STIFFENER.						
		Feet. 14	Feet. 16	Feet. 18	Feet. 20	Feet. 22	Feet. 24	Feet. 26
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
8	ANGLE	6 × 3 × ·36 4·31	5½ × 3 × ·30 5·65	5½ × 3 × ·30 5·65	5½ × 3 × ·34 5·95	6 × 3 × ·32 7·0	6 × 3 × ·34 7·15	6 × 3 × ·38 7·50
9	BULB ANGLES	5½ × 3 × ·34 5·95	6 × 3 × ·32 7·00	6 × 3 × ·34 7·15	6½ × 3 × ·34 8·35	6½ × 3 × ·38 8·75	6½ × 3 × ·40 8·95	7 × 3 × ·36 10·10
10		6 × 3 × ·36 7·30	6½ × 3 × ·34 8·35	6½ × 3 × ·38 8·75	7 × 3 × ·36 10·10	7 × 3 × ·40 10·60	7½ × 3 × ·38 12·05	7½ × 3 × ·40 12·30
11		7 × 3 × ·34 9·90	7 × 3 × ·38 10·35	7½ × 3 × ·38 12·05	7½ × 3 × ·40 12·30	8 × 3 × ·40 14·15	8 × 3 × ·42 14·45	8 × 3 × ·44 14·70
12		7½ × 3 × ·38 12·05	7½ × 3 × ·40 12·30	8 × 3 × ·40 14·15	8 × 3 × ·42 14·45	8½ × 3 × ·42 16·45	8½ × 3 × ·44 16·75	9 × 3 × ·44 19·20
13		8 × 3 × ·40 14·15	8 × 3 × ·44 14·70	8½ × 3 × ·48 17·35	9 × 3 × ·44 19·20	9 × 3 × ·46 19·53	9 × 3 × ·48 19·85	9½ × 3½ × ·46 21·85
14		8½ × 3 × ·42 16·45	9 × 3 × ·44 19·20	9 × 3 × ·44 19·20	9½ × 3½ × ·44 21·35	9½ × 3½ × ·46 21·85	10 × 3½ × ·46 24·35	10 × 3½ × ·48 24·85
15		9 × 3 × ·44 19·20	9 × 3 × ·50 20·25	9½ × 3½ × ·46 21·85	10 × 3½ × ·46 24·35	10½ × 3½ × ·46 24·5	10½ × 3½ × ·48 28·00	11 × 3½ × ·48 30·90
16		9½ × 3½ × ·46 21·85	10 × 3½ × ·46 24·35	10½ × 3½ × ·46 24·50	10½ × 3½ × ·50 28·5	11 × 3½ × ·48 30·90	11 × 3½ × ·50 31·40	11½ × 3½ × ·50 34·70
17		10 × 3½ × ·48 29·85	10½ × 3½ × ·48 28·00	11 × 3½ × ·48 30·90	11½ × 3½ × ·50 34·70	11½ × 3½ × ·52 35·3	12 × 3½ × ·50 34·40	12 × 3½ × ·52 38·30
18		11 × 3½ × ·48 30·9	11 × 3½ × ·50 31·40	11½ × 3½ × ·50 34·70	12 × 3½ × ·50 34·40	12 × 3½ × ·52 38·30	12 × 3½ × 3½ × ·46 41·4	12 × 3½ × 3½ × ·50 43·0
19		11½ × 3½ × ·50 34·7	12 × 3½ × ·50 34·40	12 × 3½ × ·52 38·30	12 × 3½ × 3½ × ·46 41·40	12 × 3½ × 3½ × ·48 42·20	12 × 3½ × 3½ × ·52 43·50	12 × 4 × 4 × ·48 46·0
20		12 × 3½ × ·50 34·7	12 × 3½ × ·56 39·50	12 × 3½ × 3½ × ·46 41·40	12 × 3½ × 3½ × ·52 43·50	12 × 4 × 4 × ·48 46·00	12 × 4 × 4 × ·52 49·60	13 × 4 × 4 × ·48 51·7
21	CHANNELS	12 × 3½ × 3½ × ·46 41·4	12 × 3½ × 3½ × ·48 42·2	12 × 4 × 4 × ·48 46·00	12 × 4 × 4 × ·50 46·80	13 × 4 × 4 × ·48 51·70	13 × 4 × 4 × ·52 53·60	14 × 4 × 4 × ·48 54·5
22		12 × 3½ × 3½ × ·54 44·60	12 × 4 × 4 × ·48 46·0	13 × 4 × 4 × ·48 51·70	13 × 4 × 4 × ·50 52·60	14 × 4 × 4 × ·48 54·50	14 × 4 × 4 × ·52 57·40	15 × 4 × 4 × ·48 63·4
23		12 × 4 × 4 × ·50 46·80	13 × 4 × 4 × ·48 51·70	14 × 4 × 4 × ·48 54·50	14 × 4 × 4 × ·50 57·60	15 × 4 × 4 × ·48 63·4	15 × 4 × 4 × ·52 65·90	
24		13 × 4 × 4 × ·50 52·60	14 × 4 × 4 × ·48 54·5	15 × 4 × 4 × ·48 63·4	15 × 4 × 4 × ·50 64·60			
25								
26								
27								

BULKHEAD STIFFENERS spaced 30 INCHES apart and fitted with BRACKET ATTACHMENTS at top and bottom in accordance with Table 30.

TABLE 27 *(Concluded.)*

Overall Length of Stiffener, including End Attachments.		HEIGHT OF TOP OF BULKHEAD AT MIDDLE LINE ABOVE TOP OF STIFFENER.						
		Feet. 28	Feet. 30	Feet. 32	Feet. 34	Feet. 36	Feet. 38	Feet. 40
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
8	BULB ANGLES	$6\frac{1}{2} \times 3 \times \cdot34$ 8.35	$6\frac{1}{2} \times 3 \times \cdot36$ 8.55	$6\frac{1}{2} \times 3 \times \cdot38$ 8.45	$7 \times 3 \times \cdot36$ 10.10	$7 \times 3 \times \cdot38$ 10.35	$7 \times 3 \times \cdot40$ 10.60	$7\frac{1}{2} \times 3 \times \cdot38$ 12.05
9		$7 \times 3 \times \cdot40$ 10.60	$7\frac{1}{2} \times 3 \times \cdot36$ 11.80	$7\frac{1}{2} \times 3 \times \cdot38$ 12.30	$7\frac{1}{2} \times 3 \times \cdot40$ 13.85	$8 \times 3 \times \cdot38$ 14.15	$8 \times 3 \times \cdot40$ 14.15	$8 \times 3 \times \cdot42$ 14.45
10		$7\frac{1}{2} \times 3 \times \cdot42$ 12.55	$8 \times 3 \times \cdot40$ 14.15	$8 \times 3 \times \cdot42$ 14.45	$8\frac{1}{2} \times 3 \times \cdot40$ 16.15	$8\frac{1}{2} \times 3 \times \cdot42$ 16.45	$8\frac{1}{2} \times 3 \times \cdot46$ 17.05	$9 \times 3 \times \cdot44$ 19.20
11		$8\frac{1}{2} \times 3 \times \cdot42$ 16.45	$8\frac{1}{2} \times 3 \times \cdot44$ 16.45	$9 \times 3 \times \cdot44$ 19.20	$9 \times 3 \times \cdot46$ 19.55	$9 \times 3 \times \cdot48$ 19.85	$9 \times 3 \times \cdot50$ 20.20	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 21.85
12		$9 \times 3 \times \cdot44$ 19.20	$9 \times 3 \times \cdot50$ 20.20	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 21.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$ 22.30	$10 \times 3\frac{1}{2} \times \cdot46$ 24.35	$10 \times 3\frac{1}{2} \times \cdot50$ 25.35	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 24.50
13		$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$ 22.30	$10 \times 3\frac{1}{2} \times \cdot46$ 24.35	$10 \times 3\frac{1}{2} \times \cdot48$ 24.85	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 24.50	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$ 28.80	$11 \times 3\frac{1}{2} \times \cdot48$ 30.90	$11 \times 3\frac{1}{2} \times \cdot50$ 31.40
14		$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 24.50	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$ 28.50	$11 \times 3\frac{1}{2} \times \cdot48$ 30.90	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$ 34.40	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$ 34.1	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot52$ 35.3	$12 \times 3\frac{1}{2} \times \cdot50$ 34.4
15		$11 \times 3\frac{1}{2} \times \cdot50$ 31.4	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$ 34.10	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot52$ 35.30	$12 \times 3\frac{1}{2} \times \cdot50$ 34.40	$12 \times 3\frac{1}{2} \times \cdot52$ 38.3	$12 \times 3\frac{1}{2} \times \cdot54$ 38.90	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 41.40
16		$12 \times 3\frac{1}{2} \times \cdot50$ 34.40	$12 \times 3\frac{1}{2} \times \cdot52$ 38.30	$12 \times 3\frac{1}{2} \times \cdot54$ 38.90	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 41.4	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$ 42.20	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$ 43.0	$12 \times 4 \times 4 \times \cdot48$ 46.00
17	CHANNELS	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 41.40	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$ 42.24	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$ 43.00	$12 \times 4 \times 4 \times \cdot48$ 46.00	$12 \times 4 \times 4 \times \cdot50$ 46.80	$12 \times 4 \times 4 \times \cdot52$ 47.60	$13 \times 4 \times 4 \times \cdot48$ 51.40
18		$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot52$ 43.80	$12 \times 4 \times 4 \times \cdot48$ 46.00	$12 \times 4 \times 4 \times \cdot50$ 46.80	$13 \times 4 \times 4 \times \cdot48$ 51.40	$13 \times 4 \times 4 \times \cdot50$ 52.60	$13 \times 4 \times 4 \times \cdot52$ 53.60	$14 \times 4 \times 4 \times \cdot48$ 54.50
19		$12 \times 4 \times 4 \times \cdot52$ 44.60	$13 \times 4 \times 4 \times \cdot48$ 51.40	$13 \times 4 \times 4 \times \cdot50$ 52.60	$14 \times 4 \times 4 \times \cdot48$ 54.50	$14 \times 4 \times 4 \times \cdot50$ 58.60	$15 \times 4 \times 4 \times \cdot48$ 63.40	$15 \times 4 \times 4 \times \cdot50$ 64.60
20		$13 \times 4 \times 4 \times \cdot52$ 53.6	$14 \times 4 \times 4 \times \cdot48$ 54.50	$14 \times 4 \times 4 \times \cdot50$ 58.60	$15 \times 4 \times 4 \times \cdot48$ 63.40	$15 \times 4 \times 4 \times \cdot50$ 64.60		
21		$14 \times 4 \times 4 \times \cdot52$ 59.40	$15 \times 4 \times 4 \times \cdot48$ 63.40	$15 \times 4 \times 4 \times \cdot52$ 65.90				
22		$15 \times 4 \times 4 \times \cdot52$ 65.90						
23								
24								
25								
26								
27								

BULKHEAD STIFFENERS spaced 30 INCHES apart and fitted with LUG ATTACHMENTS at top and bottom in accordance with Table 30.

TABLE 28

(See Continuation.)

Overall Length of Stiffener, including End Attachments.		HEIGHT OF TOP OF BULKHEAD AT MIDDLE LINE ABOVE TOP OF STIFFENER.						
		Feet. 0	Feet. 2	Feet. 4	Feet. 6	Feet. 8	Feet. 10	Feet. 12
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
8	ANGLES	*4½ × 3 × ·34 2·34	5 × 3 × ·36 3·01	5½ × 3 × ·38 3·82	6 × 3 × ·38 4·53	5½ × 3 × ·32 5·80	5½ × 3 × ·36 6·10	6 × 3 × ·32 7·00
9	ANGLES	*5½ × 3 × ·34 3·44	6 × 3 × ·32 3·89	5½ × 3 × ·32 5·80	5½ × 3 × ·36 6·10	6 × 3 × ·32 7·00	6 × 3 × ·38 7·80	6½ × 3 × ·36 8·58
10	ANGLES	*6 × 3 × ·38 4·53	5½ × 3 × ·34 5·95	6 × 3 × ·32 7·00	6½ × 3 × ·34 8·35	6½ × 3 × ·38 8·75	7 × 3 × ·36 10·10	7 × 3 × ·40 10·60
11	BULB ANGLES	5½ × 3 × ·36 6·10	6 × 3 × ·36 7·30	6½ × 3 × ·36 8·58	7 × 3 × ·36 10·10	7 × 3 × ·40 10·60	7½ × 3 × ·40 12·30	8 × 3 × ·40 14·15
12	BULB ANGLES	6 × 3 × ·38 7·30	6½ × 3 × ·40 8·95	7 × 3 × ·38 10·35	7½ × 3 × ·38 12·05	7½ × 3 × ·46 13·05	8 × 3 × ·44 14·70	8½ × 3 × ·44 14·75
13	BULB ANGLES	6½ × 3 × ·34 8·35	7 × 3 × ·40 10·60	7½ × 3 × ·42 12·55	8 × 3 × ·42 14·45	8½ × 3 × ·42 16·45	9 × 3 × ·44 19·20	9 × 3 × ·48 19·65
14	BULB ANGLES	7 × 3 × ·42 10·80	7½ × 3 × ·44 12·80	8½ × 3 × ·42 16·45	8½ × 3 × ·48 17·35	9 × 3 × ·46 19·65	9½ × 3½ × ·46 21·85	9½ × 3½ × ·50 22·45
15	BULB ANGLES	7½ × 3 × ·44 12·80	8 × 3 × ·50 15·50	9 × 3 × ·44 19·20	9 × 3 × ·50 20·20	9½ × 3½ × ·48 22·30	10 × 3½ × ·48 24·85	10½ × 3½ × ·46 24·50
16	BULB ANGLES	8½ × 3 × ·42 16·45	9 × 3 × ·44 19·20	9½ × 3½ × ·46 21·85	10 × 3½ × ·46 24·36	10 × 3½ × ·52 25·30	10½ × 3½ × ·52 29·0	11 × 3½ × ·50 31·40
17	BULB ANGLES	9 × 3 × ·46 19·55	9½ × 3½ × ·46 21·85	10 × 3½ × ·48 24·85	10½ × 3½ × ·48 28·00	11 × 3½ × ·48 30·90	11 × 3½ × ·54 32·4	11½ × 3½ × ·56 36·30
18	BULB ANGLES	9½ × 3½ × ·46 21·85	10 × 3½ × ·50 25·25	10½ × 3½ × ·52 29·00	11 × 3½ × ·50 31·40	11½ × 3½ × ·54 35·80	12 × 3½ × ·52 38·3	12 × 3½ × 3½ × ·46 36·86
19	BULB ANGLES	10 × 3½ × ·48 24·85	10½ × 3½ × ·50 28·50	11 × 3½ × ·52 31·90	11½ × 3½ × ·58 34·80	12 × 3½ × ·54 38·00	12 × 3½ × 3½ × ·46 41·4	12 × 4 × 4 × ·48 46·0
20	BULB ANGLES	11 × 3½ × ·48 30·90	11 × 3½ × ·54 32·40	12 × 3½ × ·50 34·70	12 × 3½ × 3½ × ·46 41·4	12 × 3½ × 3½ × ·48 43·2	12 × 4 × 4 × ·48 46·0	13 × 4 × 4 × ·48 51·7
21	BULB ANGLES	11 × 3½ × ·54 32·40	12 × 3½ × ·50 34·70	12 × 3½ × 3½ × ·46 41·4	12 × 3½ × 3½ × ·52 43·9	12 × 4 × 4 × ·48 46·0	13 × 4 × 4 × ·48 51·7	14 × 4 × 4 × ·48 57·5
22	BULB ANGLES	12 × 3½ × ·50 34·70	12 × 3½ × 3½ × ·46 41·4	12 × 3½ × 3½ × ·52 43·8	12 × 4 × 4 × ·52 47·6	13 × 4 × 4 × ·48 51·7	14 × 4 × 4 × ·48 57·5	15 × 4 × 4 × ·48 63·4
23	CHANNELS	12 × 3½ × 3½ × ·46 41·40	12 × 3½ × 3½ × ·54 44·6	12 × 4 × 4 × ·54 48·5	13 × 4 × 4 × ·52 53·6	14 × 4 × 4 × ·48 57·5	15 × 4 × 4 × ·48 63·40	
24	CHANNELS	12 × 3½ × 3½ × ·54 44·60	12 × 4 × 4 × ·56 49·3	13 × 4 × 4 × ·54 54·5	14 × 4 × 4 × ·52 57·4	15 × 4 × 4 × ·50 60·6		
25	CHANNELS	12 × 4 × 4 × ·54 48·50	13 × 4 × 4 × ·56 55·5	14 × 4 × 4 × ·54 60·8	15 × 4 × 4 × ·52 65·9			
26	CHANNELS	13 × 4 × 4 × ·54 54·8	14 × 4 × 4 × ·56 61·9	15 × 4 × 4 × ·54 64·2				
27	CHANNELS	14 × 4 × 4 × ·54 60·8	15 × 4 × 4 × ·56 68·4					

The ends of upper 'tween deck stiffeners marked * may be riveted to boundary bars only. (No lug attachments.)

BULKHEAD STIFFENERS spaced 30 INCHES apart and fitted with LUG ATTACHMENTS at top and bottom in accordance with Table 30.

TABLE 28

(See Continuation.)

Overall Length of Stiffener, including End Attachments.		HEIGHT OF TOP OF BULKHEAD AT MIDDLE LINE ABOVE TOP OF STIFFENER.						
		Feet. 14	Feet. 16	Feet. 18	Feet. 20	Feet. 22	Feet. 24	Feet. 26
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
8	BULB ANGLES	6 × 3 × ·40 7·65	6½ × 3 × ·34 8·35	6½ × 3 × ·38 8·76	7 × 3 × ·36 10·10	7 × 3 × ·38 10·36	7 × 3 × ·42 10·80	7½ × 3 × ·38 12·05
9		7 × 3 × ·36 10·10	7 × 3 × ·40 10·60	7 × 3 × ·46 8·20	7½ × 3 × ·40 12·30	8 × 3 × ·40 14·15	8 × 3 × ·42 14·45	8½ × 3 × ·42 16·45
10		7½ × 3 × ·38 12·05	7½ × 3 × ·44 12·80	8 × 3 × ·42 14·45	8½ × 3 × ·42 16·45	8½ × 3 × ·46 17·05	9 × 3 × ·44 19·30	9 × 3 × ·46 19·58
11		8 × 3 × ·44 14·70	8½ × 3 × ·42 16·45	8½ × 3 × ·48 17·35	9 × 3 × ·46 19·55	9 × 3 × ·50 20·20	9½ × 3½ × ·46 21·95	10 × 3½ × ·46 24·35
12		9 × 3 × ·44 19·20	9 × 3 × ·46 19·55	9½ × 3½ × ·46 21·86	9½ × 3½ × ·50 22·45	10 × 3½ × ·48 24·85	10½ × 3½ × ·40 26·00	10½ × 3½ × ·46 24·50
13		9½ × 3½ × ·46 21·85	9½ × 3½ × ·50 22·45	10 × 3½ × ·50 25·35	10½ × 3½ × ·48 28·00	11 × 3½ × ·48 30·90	11 × 3½ × ·50 31·40	11½ × 3½ × ·50 34·40
14		10 × 3½ × ·50 25·35	10½ × 3½ × ·48 28·00	11 × 3½ × ·48 30·90	11 × 3½ × ·52 31·90	11½ × 3½ × ·54 35·50	12 × 3½ × ·50 34·40	12 × 3½ × ·56 39·30
15		11 × 3½ × ·48 30·90	11 × 3½ × ·52 31·90	11½ × 3½ × ·54 35·50	12 × 3½ × ·50 34·40	12 × 3½ × 3½ × ·46 41·4	12 × 3½ × 3½ × ·48 42·2	12 × 3½ × 3½ × ·52 43·8
16		11 × 3½ × ·52 31·90	12 × 3½ × ·50 34·40	12 × 3½ × ·56 39·50	12 × 3½ × 3½ × ·46 41·4	12 × 3½ × 3½ × ·54 46·6	12 × 4 × 4 × ·48 46·0	13 × 4 × 4 × ·48 51·4
17	V	12 × 3½ × ·54 38·90	12 × 3½ × 3½ × ·46 41·4	12 × 3½ × 3½ × ·54 44·6	12 × 4 × 4 × ·48 46·0	13 × 4 × 4 × ·48 51·4	13 × 4 × 4 × ·50 52·6 58·6	14 × 4 × 4 × ·48 57·5
18	^	12 × 3½ × 3½ × ·50 43·0	12 × 4 × 4 × ·48 46·0	13 × 4 × 4 × ·48 51·4	13 × 4 × 4 × ·50 52·6	14 × 4 × 4 × ·48 57·5	14 × 4 × 4 × ·52 59·7	15 × 4 × 4 × ·48 63·4
19		12 × 4 × 4 × ·52 47·6	13 × 4 × 4 × ·48 51·4	14 × 4 × 4 × ·48 57·5	14 × 4 × 4 × ·52 59·7	15 × 4 × 4 × ·48 63·4		
20	CHANNELS	13 × 4 × 4 × ·52 53·6	14 × 4 × 4 × ·48 57·5	15 × 4 × 4 × ·48 63·4	15 × 4 × 4 × ·54 67·2			
21		14 × 4 × 4 × ·52 59·7	15 × 4 × 4 × ·52 65·9					
22								
23								
24								
25								
26								
27	V							

BULKHEAD STIFFENERS spaced 30 INCHES apart and fitted with LUG ATTACHMENTS at top and bottom in accordance with Table 30.

TABLE 28 *(Concluded.)*

Overall Length of Stiffener, including End Attachments.		HEIGHT OF TOP OF BULKHEAD AT MIDDLE LINE ABOVE TOP OF STIFFENER.						
		Feet. 28	Feet. 30	Feet. 32	Feet. 34	Feet. 36	Feet. 38	Feet. 40
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
8	^ BULB ANGLES	$7\frac{1}{2} \times 3 \times \cdot44$ 12.80	$8 \times 3 \times \cdot40$ 14.15	$8 \times 3 \times \cdot42$ 14.45	$8 \times 3 \times \cdot46$ 15.00	$8\frac{1}{2} \times 3 \times \cdot44$ 16.75	$8\frac{1}{2} \times 3 \times \cdot46$ 17.05	$8\frac{1}{2} \times 3 \times \cdot48$ 17.35
9		$8\frac{1}{2} \times 3 \times \cdot46$ 17.05	$8\frac{1}{2} \times 3 \times \cdot48$ 17.35	$9 \times 3 \times \cdot44$ 19.20	$9 \times 3 \times \cdot46$ 19.55	$9 \times 3 \times \cdot50$ 20.20	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 21.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$ 22.30
10		$9 \times 3 \times \cdot50$ 20.20	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 21.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$ 22.30	$10 \times 3\frac{1}{2} \times \cdot46$ 24.35	$10 \times 3\frac{1}{2} \times \cdot48$ 24.85	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 27.50	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$ 28.80
11		$10 \times 3\frac{1}{2} \times \cdot48$ 24.85	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 27.50	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$ 28.80	$11 \times 3\frac{1}{2} \times \cdot48$ 30.90	$11 \times 3\frac{1}{2} \times \cdot50$ 31.40	$11 \times 3\frac{1}{2} \times \cdot52$ 31.90	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$ 34.70
12		$11 \times 3\frac{1}{2} \times \cdot48$ 30.90	$11 \times 3\frac{1}{2} \times \cdot52$ 31.90	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$ 34.70	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot54$ 35.60	$12 \times 3\frac{1}{2} \times \cdot50$ 34.40	$12 \times 3\frac{1}{2} \times \cdot54$ 38.90	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$
13	v	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot54$ 35.80	$12 \times 3\frac{1}{2} \times \cdot50$ 34.40	$12 \times 3\frac{1}{2} \times \cdot56$ 39.80	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 41.40	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$ 42.20	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot50$ 43.00	$12 \times 4 \times 4 \times \cdot48$ 46.00
14	^ CHANNELS	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot46$ 41.40	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot48$ 42.20	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot54$ 44.60	$12 \times 4 \times 4 \times \cdot48$ 46.00	$12 \times 4 \times 4 \times \cdot50$ 46.80	$13 \times 4 \times 4 \times \cdot48$ 51.70	$14 \times 4 \times 4 \times \cdot48$ 57.50
15		$12 \times 4 \times 4 \times \cdot48$ 46.00	$12 \times 4 \times 4 \times \cdot52$ 47.60	$13 \times 4 \times 4 \times \cdot48$ 51.70	$13 \times 4 \times 4 \times \cdot50$ 52.60	$14 \times 4 \times 4 \times \cdot48$ 57.50	$14 \times 4 \times 4 \times \cdot50$ 58.60	$15 \times 4 \times 4 \times \cdot48$ 63.40
16		$13 \times 4 \times 4 \times \cdot50$ 52.60	$14 \times 4 \times 4 \times \cdot48$ 57.50	$14 \times 4 \times 4 \times \cdot50$ 58.60	$15 \times 4 \times 4 \times \cdot48$ 63.40	$15 \times 4 \times 4 \times \cdot50$ 64.60	$15 \times 4 \times 4 \times \cdot52$ 65.90	
17		$14 \times 4 \times 4 \times \cdot52$ 59.70	$15 \times 4 \times 4 \times \cdot48$ 63.40	$15 \times 4 \times 4 \times \cdot52$ 65.90				
18		$15 \times 4 \times 4 \times \cdot54$ 67.20						
19								
20								
21								
22								
23								
24								
25								
26								
27	v							

TABLE 29

BULKHEAD STIFFENERS in TUGS.

OVERALL LENGTH OF STIFFENERS INCLUDING END ATTACHMENTS.		STIFFENERS BRACKETED AT ENDS.	STIFFENERS WITHOUT BRACKETS OR LUGS AT ENDS.
Feet.		Inches.	Inches.
7	ANGLES	—	$3\frac{1}{2} \times 3 \times \cdot 30$ 1·30
8		$3 \times 3 \times \cdot 28$ ·92	$4 \times 3 \times \cdot 30$ 1·64
9		$3 \times 3 \times \cdot 30$ ·99	$4 \times 3 \times \cdot 32$ 1·48
10		$3\frac{1}{2} \times 3 \times \cdot 32$ 1·38	$4\frac{1}{2} \times 3 \times \cdot 34$ 2·34
11		$4 \times 3 \times \cdot 32$ 1·48	$5 \times 3 \times \cdot 34$ 2·86
12		$4\frac{1}{2} \times 3 \times \cdot 32$ 2·21	$5\frac{1}{2} \times 3 \times \cdot 34$ 3·44
13		$5 \times 3 \times \cdot 32$ 2·70	$6 \times 3 \times \cdot 36$ 4·31
14		$5\frac{1}{2} \times 3 \times \cdot 34$ 3·44	$6\frac{1}{2} \times 3 \times \cdot 36$ 5·00
15		$6 \times 3 \times \cdot 36$ 4·31	$6\frac{1}{2} \times 3 \times \cdot 38$ 5·25
16		$6\frac{1}{2} \times 3 \times \cdot 36$ 5·00	—

Stiffeners spaced 24 inches apart on collision bulkhead and 30 inches apart on other bulkheads.

Ballast tanks per Table 34 (Proposed)

TABLE 30

ATTACHMENT for STIFFENERS.

TYPE AND DEPTH OF STIFFENER.		BRACKET ATTACHMENTS.			LUG ATTACHMENTS.
		Thickness of Bracket.	Width of Flange.	Number and Size of Rivets in each Arm of Bracket.	Number and Size of Rivets in Lugs.
Angles		Inches. ·34	Inches. —	3 of $\frac{3}{4}$ Ins. Dia.	2 of $\frac{3}{4}$ Ins. Dia.
Bulb Angles under $6\frac{1}{2}$ inches		·36	—	3 „ $\frac{3}{4}$ „ „	2 „ $\frac{3}{4}$ „ „
Bulb Angles $6\frac{1}{2}$	„	·38	—	3 „ $\frac{3}{4}$ „ „	2 „ $\frac{3}{4}$ „ „
„ „ 7 and $7\frac{1}{2}$	„	·40	—	4 „ $\frac{3}{4}$ „ „	3 „ $\frac{3}{4}$ „ „
„ „ 8 „ $8\frac{1}{2}$	„	·42	—	5 „ $\frac{3}{4}$ „ „	3 „ $\frac{3}{4}$ „ „
„ „ 9 „ $9\frac{1}{2}$	„	·34	$2\frac{1}{4}$	6 „ $\frac{3}{4}$ „ „	4 „ $\frac{3}{4}$ „ „
„ „ 10 „ $10\frac{1}{2}$	„	·36	$2\frac{1}{2}$	7 „ $\frac{3}{4}$ „ „	4 „ $\frac{3}{4}$ „ „
„ „ 11 „ $11\frac{1}{2}$	„	·38	$2\frac{3}{4}$	7 „ $\frac{7}{8}$ „ „	4 „ $\frac{7}{8}$ „ „
„ „ 12	„	·40	3	8 „ $\frac{7}{8}$ „ „	5 „ $\frac{7}{8}$ „ „
Channels $12 \times 3\frac{1}{2} \times 3\frac{1}{2}$	„	·40	3	9 „ $\frac{7}{8}$ „ „	6 „ $\frac{7}{8}$ „ „
„ $12 \times 4 \times 4$	„	·40	3	10 „ $\frac{7}{8}$ „ „	7 „ $\frac{7}{8}$ „ „
„ $13 \times 4 \times 4$	„	·42	$3\frac{1}{2}$	11 „ $\frac{7}{8}$ „ „	7 „ $\frac{7}{8}$ „ „
„ $14 \times 4 \times 4$	„	·42	$3\frac{1}{2}$	12 „ $\frac{7}{8}$ „ „	8 „ $\frac{7}{8}$ „ „
„ $15 \times 4 \times 4$	„	·44	$3\frac{1}{2}$	13 „ $\frac{7}{8}$ „ „	8 „ $\frac{7}{8}$ „ „

(FLANGED)

Brackets to be 2½ times depth of stiffr or beam.

BULKHEAD PLATING. TABLE 31

STIFFENERS SPACED 30 INCHES APART.				STIFFENERS SPACED 36 INCHES APART.			
Depth at Middle Line from top of Bulkhead to Lower Edge of Plate.	Thickness.	Depth at Middle Line from top of Bulkhead to Lower Edge of Plate.	Thickness.	Depth at Middle Line from top of Bulkhead to Lower Edge of Plate.	Thickness.	Depth at Middle Line from top of Bulkhead to Lower Edge of Plate.	Thickness.
Feet.	Inches.	Feet.	Inches.	Feet.	Inches.	Feet.	Inches.
8	·26	36	·40	7	·28	35	·44
12	·28	40	·42	10·5	·30	38·5	·46
16	·30	44	·44	14	·32	42	·48
20	·32	48	·46	17·5	·34	45·5	·50
24	·34	52	·48	21	·36	49	·52
28	·36	56	·50	24·5	·38	52·5	·54
32	·38	60	·52	28	·40	56	·56
				31·5	·42	59·5	·58

TUNNEL STIFFENERS SPACED 36 ins. APART. TABLE 32

Mean Height from Base of Tunnel to Bulkhead Deck.	HEIGHT FROM BASE OF TUNNEL TO TOP OF FLAT SIDE.					
	Feet. 3	Feet. 4	Feet. 5	Feet. 6	Feet. 7	Feet. 8
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12	3 × 2½ × ·24	4 × 3 × ·26	4½ × 3 × ·30	5 × 3 × ·34	5½ × 3 × ·36	5½ × 3 × ·30
16	3½ × 2½ × ·22	4 × 3 × ·30	5 × 3 × ·32	5½ × 3 × ·36	5½ × 3 × ·30	6 × 3 × ·32
20	3½ × 2½ × ·26	4½ × 3 × ·30	5½ × 3 × ·34	6 × 3 × ·38	6 × 3 × ·32	6½ × 3 × ·34
24	4 × 3 × ·28	5 × 3 × ·32	L 6 × 3 × ·32	5½ × 3 × ·34	6 × 3 × ·36	7 × 3 × ·36
28	4 × 3 × ·30	5 × 3 × ·36	L 6 × 3 × ·40	6 × 3 × ·32	6½ × 3 × ·38	7½ × 3 × ·38
32	4½ × 3 × ·30	5½ × 3 × ·34	5½ × 3 × ·34	6½ × 3 × ·34	7 × 3 × ·38	8 × 3 × ·40
36	4½ × 3 × ·32	6 × 3 × ·32	6 × 3 × ·32	6½ × 3 × ·38	7½ × 3 × ·36	8 × 3 × ·44
40	4½ × 3 × ·34	6 × 3 × ·38	6 × 3 × ·34	7 × 3 × ·36	8 × 3 × ·40	8½ × 3 × ·46
44	5 × 3 × ·32	6 × 3 × ·40	6½ × 3 × ·34	7½ × 3 × ·38	8 × 3 × ·44	9 × 3 × ·44
48	5 × 3 × ·36	5½ × 3 × ·30	6½ × 3 × ·36	7½ × 3 × ·40	8½ × 3 × ·42	9 × 3 × ·50
52	5½ × 3 × ·34	5½ × 3 × ·34	7 × 3 × ·36	8 × 3 × ·40	9 × 3 × ·44	9½ × 3½ × ·48
56	5½ × 3 × ·36	6 × 3 × ·32	7 × 3 × ·38	8 × 3 × ·44	9 × 3 × ·50	10 × 3½ × ·46
60	6 × 3 × ·32	6 × 3 × ·34	7½ × 3 × ·38	8½ × 3 × ·42	9½ × 3½ × ·46	10½ × 3½ × ·46

ANGLES

BULB ANGLES

Angle stiffeners of 6 inches in depth and all bulb angle stiffeners are to be connected to the inner bottom plating by a lug.

Sect" Area in Red.

Seamlings for Tanks not exceeding 24'0" in depth.

Spacing

Head.	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
8	235	239	243	248	252	256	260	264	269	273	277	281	286	290	294	298	303
9	230	234	238	243	247	252	256	260	264	269	273	277	282	286	290	295	299
10	234	238	243	247	252	256	260	265	269	274	278	282	287	291	296	302	306
11	238	243	247	252	256	261	265	270	274	279	283	288	292	297	303	308	312
12	243	248	252	256	261	265	270	275	279	284	289	293	298	303	309	314	319
13	248	252	256	261	266	270	275	280	284	289	294	299	304	309	314	319	324
14	252	256	261	265	270	275	280	285	289	294	299	304	309	314	320	325	330
15	256	261	265	270	275	280	285	290	294	299	304	309	315	320	326	331	336
16	261	265	270	275	280	285	290	295	300	305	310	315	320	326	331	336	341
17	265	270	275	280	285	290	295	300	305	310	315	321	326	332	337	342	348
18	270	275	280	285	290	295	300	305	311	316	321	327	332	338	343	348	354
19	275	280	285	290	295	300	305	311	316	321	326	332	338	344	349	355	360
20	280	285	290	295	300	305	311	316	322	327	333	338	344	349	355	360	366
21	285	290	295	300	305	311	316	322	327	333	338	344	349	355	361	366	372
22	290	295	300	305	311	316	322	327	333	338	344	349	355	361	366	372	378
23	295	300	305	311	316	322	327	333	338	344	349	355	361	366	372	378	384
24	300	305	311	316	322	327	333	338	344	349	355	361	366	372	378	384	390
25	305	311	316	322	327	333	338	344	349	355	361	366	372	378	384	390	396
26	311	316	322	327	333	338	344	349	355	361	366	372	378	384	390	396	402
27	316	322	327	333	338	344	349	355	361	366	372	378	384	390	396	402	408
28	322	327	333	338	344	349	355	361	366	372	378	384	390	396	402	408	414
29	327	333	338	344	349	355	361	366	372	378	384	390	396	402	408	414	420
30	333	338	344	349	355	361	366	372	378	384	390	396	402	408	414	420	426
31	338	344	349	355	361	366	372	378	384	390	396	402	408	414	420	426	432
32	344	349	355	361	366	372	378	384	390	396	402	408	414	420	426	432	438
33	349	355	361	366	372	378	384	390	396	402	408	414	420	426	432	438	444
34	355	361	366	372	378	384	390	396	402	408	414	420	426	432	438	444	450
35	361	366	372	378	384	390	396	402	408	414	420	426	433	439	445	451	457
36	366	372	378	384	390	396	402	408	414	420	426	433	439	445	451	457	463
37	372	378	384	390	396	402	408	414	420	426	433	439	445	451	457	463	469
38	378	384	390	396	402	408	414	420	426	433	439	445	451	457	463	469	475
39	384	390	396	402	408	414	420	426	433	439	445	451	457	463	469	475	481
40	390	396	402	408	414	420	426	433	439	445	451	457	463	469	475	481	487
41	396	402	408	414	420	426	433	439	445	451	457	463	469	475	481	487	493
42	402	408	414	420	426	433	439	445	451	457	463	469	475	481	487	493	499
43	408	414	420	426	433	439	445	451	457	463	469	475	481	487	493	499	505
44	414	420	426	433	439	445	451	457	463	469	475	481	487	493	499	505	511
45	420	426	433	439	445	451	457	463	469	475	481	487	493	499	505	511	517
46	426	433	439	445	451	457	463	469	475	481	487	493	499	505	511	517	523
47	433	439	445	451	457	463	469	475	481	487	493	499	505	511	517	523	529
48	439	445	451	457	463	469	475	481	487	493	499	505	511	517	523	529	535
49	445	451	457	463	469	475	481	487	493	499	505	511	517	523	529	535	541
50	451	457	463	469	475	481	487	493	499	505	511	517	523	529	535	541	547
51	457	463	469	475	481	487	493	499	505	511	517	523	529	535	541	547	553
52	463	469	475	481	487	493	499	505	511	517	523	529	535	541	547	553	559
53	469	475	481	487	493	499	505	511	517	523	529	535	541	547	553	559	565
54	475	481	487	493	499	505	511	517	523	529	535	541	547	553	559	565	571
55	481	487	493	499	505	511	517	523	529	535	541	547	553	559	565	571	577
56	487	493	499	505	511	517	523	529	535	541	547	553	559	565	571	577	583
57	493	499	505	511	517	523	529	535	541	547	553	559	565	571	577	583	589
58	499	505	511	517	523	529	535	541	547	553	559	565	571	577	583	589	595
59	505	511	517	523	529	535	541	547	553	559	565	571	577	583	589	595	601
60	511	517	523	529	535	541	547	553	559	565	571	577	583	589	595	601	607

at 14'-0" 6" increase : 03
" 21'-0 " " : 035
" 28'-0 " " : 04.

21

Angle stiffeners of 6 inches in depth and all bulb angle stiffeners are to be connected to the inner bottom plating by a lug.

HORIZONTAL GIRDERS in OIL FUEL TANKS. TABLE 33

VALUES OF $\frac{S^2 \times D \times H}{100}$		GIRDER.	
		Intercostal.	Face Bars.
		Inches.	Inches.
140	<ANGLES>	12 × ·38	5 × 3 × ·34
180	<ANGLES>	15 × ·38	4½ × 3 × ·30
220	BULB ANGLES	15 × ·38	6 × 3 × ·30
260	BULB ANGLES	15 × ·38	6 × 3 × ·42
300	BULB ANGLES	18 × ·38	6 × 3 × ·34
340	BULB ANGLES	18 × ·38	6½ × 3 × ·42
380	BULB ANGLES	21 × ·40	6 × 3 × ·34
420	BULB ANGLES	21 × ·40	7 × 3 × ·36
460	BULB ANGLES	21 × ·40	7½ × 3 × ·40
500	BULB ANGLES	21 × ·40	7½ × 3 × ·46
550	BULB ANGLES	24 × ·40	7 × 3 × ·44
600	BULB ANGLES	24 × ·40	7½ × 3 × ·48
650	BULB ANGLES	27 × ·40	7 × 3 × ·40
700	BULB ANGLES	27 × ·40	7½ × 3 × ·44
750	BULB ANGLES	27 × ·40	8 × 3 × ·48
800	BULB ANGLES	27 × ·40	8½ × 3 × ·50
850	BULB ANGLES	30 × ·40	8 × 3 × ·42
910	BULB ANGLES	30 × ·40	8 × 3 × ·50
970	BULB ANGLES	30 × ·40	9 × 3 × ·50

VALUES OF $\frac{S^2 \times D \times H}{100}$		GIRDER.	
		Intercostal.	Face Bars.
		Inches.	Inches.
1030	BULB ANGLES	33 × ·40	8 × 3 × ·46
1100	BULB ANGLES	33 × ·40	9 × 3 × ·50
1190	BULB ANGLES	33 × ·40	10 × 3½ × ·48
1260	BULB ANGLES	36 × ·42	8½ × 3 × ·50
1340	BULB ANGLES	36 × ·42	9½ × 3½ × ·48
1420	BULB ANGLES	36 × ·42	10 × 3½ × ·52
1500	BULB ANGLES	39 × ·44	9 × 3 × ·50
1580	BULB ANGLES	39 × ·44	10 × 3½ × ·48
1685	BULB ANGLES	39 × ·44	10 × 3½ × ·56
1795	BULB ANGLES	42 × ·46	9 × 3½ × ·54
1905	BULB ANGLES	42 × ·46	10 × 3½ × ·56
2070	BULB ANGLES	42 × ·46	11 × 3½ × ·60
2190	BULB ANGLES	45 × ·48	10 × 3½ × ·58
2330	BULB ANGLES	45 × ·48	11 × 3½ × ·60
2470	BULB ANGLES	45 × ·48	12 × 3½ × ·60
2610	BULB ANGLES	48 × ·50	11½ × 3½ × ·56
2750	BULB ANGLES	48 × ·50	12 × 3½ × ·60
2890	BULB ANGLES	48 × ·50	12 × 3½ × ·68
3030 to 3140	BULB ANGLES		

Check scantlings under 10 T/in² max stress

Scantlings in Table. Test stress for tank not exceeding 24'-0" in depth, taken as 3/4 mark of tank

VERTICAL STIFFENERS on BOUNDARY BULKHEADS of OIL FUEL BUNKERS and DEEP WATER BALLAST TANKS. TABLE 34

+ Deep Tanks.

Scantlings in this table applicable to a length of tank 35' for W.B. tanks 30' " OF

HEAD H

Stiffrs spaced 24" apart Bracketed Tops Bottoms.

Overall Length of Stiffener including End Attachments.		Feet. 0	Feet. 4	Feet. 8	Feet. 12	Feet. 16	Feet. 20	Feet. 24	Feet. 28
Feet. 5	ANGLES	Inches. 3 × 3 × ·24 1·78	Inches. 3½ × 3 × ·26 1·14	Inches. 5 × 3 × ·36 3·01	Inches. 6 × 3 × ·38 4·53	Inches. 6½ × 3 × ·42 5·76	Inches. 6 × 3 × ·36 7·3	Inches. 6 × 3 × ·40 7·65	Inches. 6½ × 3 × ·38 8·75
6	ANGLES	3½ × 3 × ·28 1·22	5 × 3 × ·34 2·86	6 × 3 × ·38 4·63	6½ × 3 × ·44 6·08	6 × 3 × ·36 7·3	6½ × 3 × ·40 8·95	7 × 3 × ·42 10 8	7½ × 3 × ·40 12·3
7	ANGLES	4 × 3 × ·36 2·0	5½ × 3 × ·42 4·2	6½ × 3 × ·46 6 28	6 × 3 × ·36 7·3	6½ × 3 × ·40 8·95	7 × 3 × ·42 10·8	8 × 3 × ·44 14·7	8½ × 3 × ·42 16 45
8	ANGLES	5 × 3 × ·36 3·01	6 × 3 × ·36 4·31	6 × 3 × ·36 7·3	6½ × 3 × ·44 9·35	7½ × 3 × ·44 12·8	8 × 3 × ·44 14·7	8½ × 3 × ·46 17·05	9 × 3 × ·50 20·2
9	ANGLES	5½ × 3 × ·42 4·2	6 × 3 × ·42 7·8	6½ × 3 × ·44 9·35	7 × 3 × ·50 11 65	8½ × 3 × ·44 16 75	9 × 3 × ·46 19·55	9½ × 3½ × ·46 21·95	10 × 3½ × ·50 25 35
10	ANGLES	6 × 3 × ·48 5·63	6½ × 3 × ·36 8·55	7½ × 3 × ·40 12·3	8 × 3 × ·50 15·5	9 × 3 × ·50 20 20	10 × 3½ × ·50 23 35	10½ × 3½ × ·50 28 5	11 × 3½ × ·50 31·4
11	BULB ANGLES	6 × 3 × ·40 7·65	7 × 3 × ·44 11·0	8 × 3 × ·50 15·5	9 × 3 × ·50 20·2	10 × 3½ × ·50 25 35	10½ × 3½ × ·60 31·0	11 × 3½ × ·60 33·9	12 × 3½ × ·54 38 4
12	BULB ANGLES	7 × 3 × ·34 9·9	8 × 3 × ·38 13 85	9 × 3 × ·44 19·2	10 × 3½ × ·50 25·35	10½ × 3½ × ·60 31·0	11 × 3½ × ·68 35·5	12 × 3½ × ·60 40·6	12 × 3½ × 3½ × ·60 47·0
13	BULB ANGLES	7½ × 3 × ·40 12·3	8½ × 3 × ·44 16·45	9 × 3 × ·50 20·2	10½ × 3½ × ·60 31·0	11 × 3½ × ·66 35·4	12 × 3½ × ·68 42·6	12 × 3½ × 3½ × ·60 47·0	13 × 4 × 4 × ·60 57·5
14	BULB ANGLES	8 × 3 × ·50 15·5	9 × 3 × ·54 20 9	10 × 3½ × ·60 27·4	11 × 3½ × ·68 38·5	12 × 3½ × ·66 42·1	12 × 3½ × 3½ × ·62 47·8	13 × 4 × 4 × ·60 57·5	14 × 4 × 4 × ·62 65 4
15	BULB ANGLES	8½ × 3 × ·58 18 85	10 × 3½ × ·54 26·3	11 × 3½ × ·58 33·4	12 × 3½ × ·68 42·6	12 × 3½ × 3½ × ·60 47·0	13 × 4 × 4 × ·62 58·5	14 × 4 × 4 × ·62 65·4	15 × 4 × 4 × ·66 74·8
16	BULB ANGLES	9½ × 3½ × ·52 23·2	10½ × 3½ × ·60 31·0	12 × 3½ × ·56 39·5	12 × 3½ × 3½ × ·60 47·0	13 × 4 × 4 × ·60 57·5	14 × 4 × 4 × ·64 66·6	15 × 4 × 4 × ·66 74·8	
17	BULB ANGLES	10 × 3½ × ·60 27·4	11 × 3½ × ·66 35·1	12 × 3½ × 3½ × ·58 46·2	12 × 4 × 4 × ·70 55·1	14 × 4 × 4 × ·64 66·6	15 × 4 × 4 × ·66 73·6		
18	BULB ANGLES	11 × 3½ × ·56 32·9	12 × 3½ × ·66 42·1	12 × 4 × 4 × ·68 54·3	14 × 4 × 4 × ·66 67·4	15 × 4 × 4 × ·66 74·8			
19	BULB ANGLES	11 × 3½ × ·66 35·1	12 × 3½ × 3½ × ·66 49·2	13 × 4 × 4 × ·68 61·5	15 × 4 × 4 × ·68 76·1				
20	CHANNELS	12 × 3½ × 3½ × ·60 47·0	13 × 4 × 4 × ·66 60·5	14 × 4 × 4 × 69 69·9					
21	CHANNELS	12 × 4 × 4 × ·64 52·6	14 × 4 × 4 × ·66 67·4	15 × 4 × 4 × ·70 77·8					
22	CHANNELS	13 × 4 × 4 × ·66 60·5	74·8	84·8					
23	CHANNELS	14 × 4 × 4 × ·68 68·8							
24	CHANNELS	15 × 4 × 4 × ·70 74·5							

There is pillar as well as ℄ Bhd. Bhd stiffs may be reduced 20% Sect 21 1(6) (except Holds and shafts)

TABLE 34

VERTICAL STIFFENERS ON BOUND. BULKHEADS OF OIL FUEL BUNKERS & DEEP WATERBALLAST TANKS

HEAD H

OVERALL LENGTH OF STIFFENER		0'	1'	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'	21'	22'	23'	24'	25'	26'	27'	28'	
3		·19	·20	·21	·22	·23	·46	·68	·90	1·12	1·29	1·46	1·63	1·79	1·83	1·87	1·91	1·95	2·02	2·08	2·15	2·21	2·31	2·41	2·51	2·60	2·80	3·00	3·20	3·40	ANGLES
3·5		·30	·35	·41	·45	·49	·75	1·00	1·25	1·50	1·75	2·00	2·25	2·50	2·54	2·58	2·62	2·65	2·75	2·85	2·95	3·05	3·19	3·33	3·47	3·61	3·84	4·06	4·29	4·51	
4		·43	·52	·61	·70	·79	1·08	1·37	1·66	1·94	2·23	2·51	2·80	3·08	3·18	3·28	3·38	3·48	3·61	3·74	3·87	4·00	4·21	4·41	4·62	4·82	5·07	5·31	5·56	5·80	
4·5		·59	·73	·87	1·01	1·15	1·48	1·81	2·14	2·46	2·77	3·08	3·39	3·70	3·87	4·03	4·19	4·35	4·54	4·73	4·92	5·11	5·39	5·66	5·93	6·20	6·45	6·70	6·95	7·20	
5		·78	·95	1·12	1·29	1·45	1·84	2·23	2·62	3·01	3·39	3·77	4·15	4·53	4·84	5·16	5·46	5·76	6·15	6·53	6·92	7·30	7·39	7·48	7·57	7·65	7·93	8·20	8·48	8·75	
5·5		1·00	1·29	1·58	1·87	2·16	2·57	2·97	3·37	3·77	4·16	4·54	4·93	5·31	5·62	5·92	6·23	6·53	6·93	7·33	7·73	8·13	8·41	8·68	8·95	9·23	9·56	9·88	10·21	10·53	
6	ANGLES	1·22	1·63	2·04	2·45	2·86	3·28	3·70	4·12	4·53	4·92	5·31	5·70	6·08	6·39	6·69	7·00	7·30	7·72	8·13	8·54	8·95	9·42	9·88	10·34	10·80	11·18	11·55	11·93	12·30	BULB ANGLES
6·5		1·61	2·09	2·57	3·05	3·53	4·00	4·47	4·94	5·41	5·73	6·05	6·37	6·69	7·05	7·41	7·77	8·13	8·57	9·01	9·44	9·88	10·60	11·32	12·04	12·75	13·16	13·57	13·98	14·38	
7		2·00	2·55	3·10	3·65	4·20	4·72	5·24	5·76	6·28	6·54	6·79	7·05	7·30	7·72	8·13	8·54	8·95	9·42	9·88	10·34	10·80	11·78	12·75	13·73	14·70	15·14	15·58	16·02	16·45	
7·5		2·51	2·95	3·38	3·82	4·26	4·89	5·53	6·16	6·79	7·18	7·56	7·95	8·33	8·97	9·61	10·24	10·88	11·35	11·82	12·29	12·75	13·53	14·32	15·10	15·88	16·49	17·11	17·72	18·33	
8		3·01	3·34	3·66	3·99	4·31	5·06	5·81	6·56	7·30	7·81	8·33	8·84	9·35	10·22	11·08	11·94	12·80	13·28	13·75	14·23	14·70	15·29	15·88	16·47	17·05	17·84	18·63	19·42	20·20	
8·5		3·61	4·22	4·83	5·45	6·06	6·61	7·20	7·77	8·30	8·88	9·42	9·96	10·50	11·57	12·64	13·71	14·78	15·37	15·95	16·54	17·13	17·71	18·29	18·87	19·45	20·29	21·12	21·95	22·78	
9		4·20	5·10	6·00	6·90	7·80	8·19	8·58	8·97	9·35	9·93	10·50	11·08	11·65	12·93	14·20	15·48	16·75	17·45	18·15	18·85	19·55	20·13	20·70	21·28	21·85	22·73	23·60	24·48	25·35	
9·5		4·92	5·73	6·55	7·36	8·18	8·84	9·51	10·17	10·83	11·52	12·20	12·89	13·58	14·81	16·02	17·25	18·48	19·47	20·47	21·46	22·45	23·14	23·82	24·50	25·18	25·98	26·78	27·58	28·38	
10		5·63	6·36	7·09	7·82	8·55	9·49	10·43	11·37	12·30	13·10	13·90	14·70	15·50	16·68	17·85	19·03	20·20	21·49	22·78	24·07	25·35	26·14	26·93	27·72	28·50	29·23	29·95	30·68	31·40	
10·5		6·64	7·43	8·21	9·00	9·78	10·81	11·84	12·87	13·90	14·89	15·88	16·87	17·85	19·08	20·32	21·56	22·78	24·13	25·48	26·83	28·18	28·94	29·69	30·45	31·20	32·19	33·18	34·17	35·15	
11		7·65	8·49	9·33	10·17	11·00	12·13	13·25	14·38	15·50	16·68	17·85	19·03	20·20	21·49	22·78	24·07	25·35	26·77	28·18	29·59	31·00	31·73	32·45	33·18	33·90	35·15	36·40	37·65	38·90	
11·5		8·78	9·69	10·61	11·52	12·43	13·66	14·89	16·12	17·35	18·71	20·07	21·43	22·78	24·13	25·48	26·83	28·18	29·45	30·72	31·99	33·25	34·26	35·25	36·25	37·25	38·68	40·10	41·53	42·95	
12		9·90	10·89	11·88	12·87	13·85	15·19	16·53	17·87	19·20	20·74	22·28	23·82	25·35	26·77	28·18	29·59	31·00	32·13	33·25	34·38	35·50	36·78	38·05	39·33	40·60	42·20	43·80	45·40	47·00	
12·5		11·10	12·15	13·20	14·25	15·30	16·72	18·14	19·56	20·98	22·78	24·58	26·38	28·18	29·40	30·62	31·84	33·05	34·55	36·05	37·55	39·05	40·24	41·43	42·62	43·80	45·92	48·03	50·14	52·25	
13		12·30	13·42	14·53	15·64	16·75	18·25	19·75	21·25	22·75	24·82	26·88	28·94	31·00	32·03	33·05	34·08	35·10	36·98	38·85	40·73	42·60	43·70	44·80	45·90	47·00	49·63	52·25	54·88	57·50	
13·5		13·90	15·14	16·37	17·60	18·83	20·43	22·03	23·63	25·23	27·24	29·24	31·25	33·25	34·59	35·93	37·27	38·60	40·25	41·90	43·55	45·20	46·97	48·73	50·49	52·25	54·55	56·85	59·15	61·45	
14		15·50	16·85	18·20	19·55	20·90	22·60	24·30	26·00	27·70	29·65	31·60	33·55	35·50	37·15	38·80	40·45	42·10	43·53	44·95	46·38	47·80	50·23	52·65	55·08	57·50	59·48	61·45	63·43	65·40	
14·5		17·18	18·79	20·39	22·00	23·60	25·34	27·08	28·82	30·55	32·68	34·80	36·93	39·05	40·43	41·80	43·18	44·55	46·70	48·85	51·00	53·15	55·23	57·30	59·38	61·45	63·62	65·78	67·04	70·10	
15	BULB ANGLES	18·85	20·72	22·58	24·44	26·30	28·08	29·85	31·63	33·40	35·70	38·00	40·30	42·60	43·70	44·80	45·90	47·00	49·88	52·75	55·63	58·50	60·23	61·95	63·68	65·40	67·75	70·10	72·45	74·80	CHANNEL BARS
15·5		21·03	22·94	24·84	26·75	28·65	30·60	32·55	34·50	36·45	38·54	40·62	42·71	44·80	46·67	48·53	50·39	52·25	54·83	57·40	59·98	62·55	64·44	66·33	68·22	70·10					
16		23·20	25·15	27·10	29·05	31·00	33·13	35·25	37·38	39·50	41·38	43·25	45·13	47·00	49·63	52·25	54·88	57·50	59·78	62·05	64·33	66·60	68·65	70·70	72·75	74·80					
16·5		25·45	27·35	29·25	31·15	33·05	35·50	37·95	40·40	42·85	44·90	46·95	49·00	51·05	53·80	56·55	59·30	62·05	64·21	66·38	68·54	70·70									
17		27·70	29·55	31·40	33·25	35·10	37·88	40·65	43·43	46·20	48·43	50·65	52·88	55·10	57·98	60·85	63·73	66·60	68·65	70·70	72·75	74·80									
17·5		30·30	32·38	34·45	36·53	38·60	41·52	44·43	47·34	50·25	53·04	55·83	58·62	61·40	63·73	66·05	68·38	70·70													
18		32·90	35·20	37·50	39·80	42·10	45·15	48·20	51·25	54·30	57·65	61·00	64·35	67·70	69·48	71·25	73·03	74·80													
18·5		34·00	36·94	39·87	42·82	45·75	48·79	51·83	54·87	57·90	61·40	64·90	68·40	71·90																	
19		35·10	38·68	42·25	45·83	49·40	52·43	55·45	58·48	61·50	65·15	68·80	72·45	76·10																	
19·5		41·05	44·53	48·00	51·48	54·95	57·64	60·83	63·02	65·70																					
20		47·00	50·38	53·75	57·13	60·50	62·85	65·20	67·55	69·90																					
21		52·60	56·38	60·15	64·93	67·7																									
22		60·5																													
23		38·6																													
24		77·6																													

Check scantlings under 10 T/in² max stress

Scantlings in Table. Test stress for land not exceeding 24'-0" in depth + taken as 3/4 depth of land

VERTICAL STIFFENERS on BOUNDARY BULKHEADS of

Overall Length of Stiffener including End Attachments. Feet.	ANGLES	BULB ANGLES	CHANNELS
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17		1	
18		1	
19		1	
20		12	
21		12	
22		13	
23		14	
24		15	

There ½ pillars as well as ¼ Bhd. Bhd stiffrs may be reduced 20% Secs 21 1(6) (except Hatch end stiffrs).

Stiffrs may be reduced for decreased span at ends, but not below reductions allowed for ½ pillars 1(Interpolations) p5.

NON-WATERTIGHT BULKHEADS. TABLE 35

OVERALL LENGTH OF STIFFENER.		* STIFFENERS TWO FRAME SPACES APART FITTED TO NON-WATERTIGHT MIDDLE LINE BULKHEADS ACTING IN LIEU OF A ROW OF PILLARS.			* STIFFENERS TWO FRAME SPACES APART FITTED TO LONGITUDINAL BUNKER BULKHEADS ACTING IN LIEU OF A ROW OF PILLARS.			* STIFFENERS TWO FRAME SPACES APART FITTED TO LONGITUDINAL BUNKER BULKHEADS NOT ACTING IN LIEU OF A ROW OF PILLARS.	STIFFENERS TO TRANSVERSE BUNKER BULKHEADS SPACED 36 INCHES APART.
		Under Upper Deck.	Under Second Deck.	Under Third Deck.	Under Upper Deck.	Under Second Deck.	Under Third Deck.		
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
8	ANGLES	5 ×3 ×·30 2.55	5½×3 ×·36 3.63	5½×3 ×·36 6.10	4½×3 ×·32 2.21	5½×3 ×·32 3.26	5 ×3 ×·40 5.20	4 ×3 ×·30 1.64	4 ×3×·30 1.64
10	ANGLES	5 ×3 ×·32 2.40	6 ×3 ×·40 4.75	6 ×3 ×·36 7.30	4½×3 ×·34 2.34	6 ×3 ×·36 4.31	5½×3 ×·40 6.40	4½×3 ×·30 2.08	4½×3×·30 2.08
12	ANGLES	5 ×3 ×·36 3.01	5½×3 ×·40 6.40	6½×3 ×·38 8.75	4½×3 ×·38 2.60	6½×3 ×·40 5.50	6 ×3 ×·40 7.65	4½×3 ×·34 2.34	4½×3×·34 2.34
14	ANGLES	5½×3 ×·36 3.63	6½×3 ×·40 8.95	7 ×3 ×·42 10.80	5 ×3 ×·38 3.16	6 ×3 ×·40 4.65	6½×3 ×·42 9.15	5 ×3 ×·34 2.86	5 ×3×·34 2.86
16	BULB ANGLES	5½×3 ×·38 6.25	7½×3 ×·40 12.30	8 ×3 ×·46 15.00	6 ×3 ×·38 4.53	7 ×3 ×·40 10.60	7½×3 ×·44 12.90	6 ×3 ×·34 4.09	6 ×3×·34 4.04
18	BULB ANGLES	6½×3 ×·40 8.95	8 ×3 ×·46 15.00	9 ×3 ×·50 20.20	6 ×3 ×·40 7.65	7½×3 ×·46 13.05	8½×3 ×·46 17.05	6 ×3 ×·34 4.15	5½×3×·36 6.10
20	BULB ANGLES	7 ×3 ×·44 11.00	9 ×3 ×·48 19.85	10 ×3½×·52 25.30	6½×3 ×·42 9.15	8½×3 ×·46 17.05	9½×3½×·48 22.70	6½×3 ×·38 8.45	6 ×3×·36 4.30
22	BULB ANGLES	8 ×3 ×·44 14.40	10 ×3½×·48 24.85	11 ×3½×·54 32.40	7½×3 ×·42 12.55	9½ ×3½×·46 21.85	10½×3½×·48 28.00	7½×3 ×·38 12.05	6½×3×·38 8.75
24	BULB ANGLES	9 ×3 ×·44 19.20	10½×3½×·50 28.5	12 ×3½×·54 38.90	8½×3 ×·42 16.45	10 ×3½×·46 24.35	11 ×3½×·56 32.40	8 ×3 ×·40 14.15	7 ×3×·40 10.60
26	BULB ANGLES	9½×3½×·46 21.85	11½×3½×·50 34.4		9 ×3 ×·42 18.85	10½×3½×·54 29.5	12 ×3½×·52 38.30	8½×3 ×·44 16.75	7½×3×·42 12.55
28	BULB ANGLES	10 ×3½×·48 24.85	12 ×3½×·54 38.4		9½×3½×·44 21.35	11 ×3½×·56 32.9		9 ×3 ×·44 19.20	8 ×3×·42 14.45
30	BULB ANGLES	10½×3½×·50 28.85	43.1		10 ×3½×·44 23.85	12 ×3½×·56 39.5		9½×3½×·46 21.65	8 ×3×·46 15.00

* Where frames are spaced not more than 30 inches apart.

At hatch end beams where pillars at one frame space reduce pillars 1/6 75% rules.

With pillar at centre of hatch side coaming reduce pillar 1/6 90% rule with quarter pillars.

Strength of stiffeners reduced 20% on hatch.

Watch ends Single Bar. of rule top bracketed.

If I Beams are fitted, the thickness of web should be not less than thickness of plate in the

Figures in red are ½ of web.

3 Times stress for 5" Hatch for this Table

HATCH WEBS.

TABLE A.

TABLE 36

(See Continuation)

WEB PLATE BEAMS.

BREADTH OF HATCHWAY.	WITHOUT FORE AND AFTERS. Spacing Centre to Centre. Feet. 4 ¼	Feet. 5 ¼	WITH FORE AND AFTERS. Spacing Centre to Centre. Feet. 6 ¼	Feet. 8 ¼	Feet. 10 ¼	DOUBLE ANGLES ON UPPER AND LOWER EDGES OF WEB.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
10	9 × ·30 32	10 × ·30 34	11 × ·30 42	12 × ·32 45	14 × ·34 60	3 × 3 × ·40
12	10 × ·30 34	11 × ·30 42	12 × ·32 46	14 × ·34 60	17 × ·36 79	3 × 3 × ·40
14	11 × ·30 44	12 × ·32 50	14 × ·34 62	17 × ·36 82	20 × ·38 106	3 × 3 × ·42
16	12 × ·32 54	14 × ·34 64	16 × ·36 82	19 × ·38 104	22 × ·38 124	3½ × 3 × ·42
18	14 × ·34 76	16 × ·36 91	18 × ·36 104	21 × ·38 132	25 × ·40 169	4 × 3 × ·44
20	15 × ·34 83	18 × ·36 104	20 × ·38 126	24 × ·40 158	28 × ·42 199	4 × 3 × ·44
22	16 × ·36 101	19 × ·36 124	22 × ·38 155	26 × ·42 194	30 × ·44 242	4½ × 3 × ·46
24	17 × ·36 119	20 × ·38 148	23 × ·40 180	28 × ·42 235	32 × ·44 284	5 × 3½ × ·46
26	18 × ·36 142	21 × ·38 144	24 × ·40 204	29 × ·42 240	34 × ·46 340	5½ × 3½ × ·48
28	19 × ·38 168	22 × ·38 202	25 × ·40 240	31 × ·44 322	36 × ·48 399	6 × 3½ × ·50
30	20 × ·38 184	23 × ·40 222	26 × ·42 264	32 × ·44 [illegible]	38 × ·48 442	6 × 3½ × ·52

The depths are measured from the top edge of uppermost mounting to lower edge of lower mounting at the middle of the beam.
The depth at the ends is to be one half of the depth at the middle, but in no case less than 6 inches.
The larger flanges of the mounting angles are to be fitted horizontally.

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CENTRE FORE AND AFTERS.†

LENGTH OF FORE AND AFTER.	STEEL BULB PLATE. Spacing of Fore and Afters. Feet. 3	Feet. 4	Feet. 5	DOUBLE ANGLES ON UPPER EDGE.	WOOD. Spacing of Fore and Afters. Feet. 3 Depth.	Breadth.	Feet. 4 Depth.	Breadth.	Feet. 5 Depth.	Breadth.
Feet.	Inches. ¼	Inches. (with angles on upper edge)	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
6	6 × ·36 55	6½ × ·38 6·0	7 × ·38 7·6	2½ × 2½ × ·36	5½	7	6	7	6½	7
8	7 × ·42 7·9	8 × ·44 11·0	9 × ·44 14·6	2½ × 2½ × ·38	6½	7	7½	7	8	7
10	8 × ·50 11·6	9½ × ·50 17·1	11 × ·50 24·3	2½ × 2½ × ·40	7¾ 8	7	8 8½	7½ 8	9	9

SIDE FORE AND AFTERS.†

LENGTH OF FORE AND AFTER.	STEEL BULB ANGLE. Spacing of Fore and Afters. Feet. 3	Feet. 4	Feet. 5	ANGLE ON UPPER EDGE OF BULB ANGLE.	WOOD. Spacing of Fore and Afters. Feet. 3 Depth.	Breadth.	Feet. 4 Depth.	Breadth.	Feet. 5 Depth.	Breadth.
Feet.	Inches. ¼	Inches. (with angle on upper edge)	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
6	6 × 3 × ·36 5·6	6½ × 3½ × ·38 6·8	7 × 3½ × ·38 9·8	2½ × 2½ × ·36	5½	5½	6	6	6½	6
8	7 × 3½ × ·42 8·3	8 × 3½ × ·44 11·2	9 × 3½ × ·44 14·6	2½ × 2½ × ·38	6½	6½	7½	7	8	7
10	8 × 3½ × ·50 12·2	9½ × 3½ × ·50 17·5	11 × 3½ × ·50 24·0	2½ × 2½ × ·40	7¾ 8	6 3/4 7	8 8½	7½ 8	9	9

† Depths of fore and afters are measured to under side of covers, and the bulb plate of the centre fore and after is to be extended to the top of the wood covers.

NON-WATERTIGHT BULKHEADS. TABLE 35

OVERALL LENGTH OF STIFFENER.		* STIFFENERS TWO FRAME SPACES APART FITTED TO NON-WATERTIGHT MIDDLE LINE BULKHEADS ACTING IN LIEU OF A ROW OF PILLARS.			* STIFFENERS TWO FRAME SPACES APART FITTED TO LONGITUDINAL BUNKER BULKHEADS ACTING IN LIEU OF A ROW OF PILLARS.			* STIFFENERS TWO FRAME SPACES APART FITTED TO LONGITUDINAL BUNKER BULKHEADS NOT ACTING IN LIEU OF A ROW OF PILLARS.	STIFFENERS TO TRANSVERSE BUNKER BULKHEADS SPACED 36 INCHES APART.
		Under Upper Deck.	Under Second Deck.	Under Third Deck.	Under Upper Deck.	Under Second Deck.	Under Third Deck.		
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
8	ANGLES	5 ×3 ×·30	5½×3 ×·36	5½×3 ×·36	4½×3 ×·32	5½×3 ×·32	5 ×3 ×·40	4 ×3 ×·30	4 ×3×·30
10	ANGLES	5 ×3 ×·32	6 ×3 ×·40	6 ×3 ×·36	4½×3 ×·34	6 ×3 ×·36	5½×3 ×·40	4½×3 ×·30	4½×3×·30
12	ANGLES	5 ×3 ×·36	5½×3 ×·40	6½×3 ×·38	4½×3 ×·38	6½×3 ×·40	6 ×3 ×·40	4½×3 ×·34	4½×3×·34
14	ANGLES	5½×3 ×·36	6½×3 ×·40	7 ×3 ×·42	5 ×3 ×·38	6 ×3 ×·40	6½×3 ×·42	5 ×3 ×·34	5 ×3×·34
16	BULB ANGLES	5½×3 ×·38	7½×3 ×·40	8 ×3 ×·46	6 ×3 ×·38	7 ×3 ×·40	7½×3 ×·44	6 ×3 ×·34	6 ×3×·34
18	BULB ANGLES	6½×3 ×·40	8 ×3 ×·46	9 ×3 ×·50	6 ×3 ×·40	7½×3 ×·46	8½×3 ×·46	6 ×3 ×·34	5½×3×·36
20	BULB ANGLES	7 ×3 ×·44	9 ×3 ×·48	10 ×3½×·52	6½×3 ×·42	8½×3 ×·46	9½×3½×·48	6½×3 ×·38	6 ×3×·36
22	BULB ANGLES	8 ×3 ×·44	10 ×3½×·48	11 ×3½×·54	7½×3 ×·42	9½ ×3½×·46	10½×3½×·48	7½×3 ×·38	6½×3×·38
24	BULB ANGLES	9 ×3 ×·44	10½×3½×·50	12 ×3½×·54	8½×3 ×·42	10 ×3½×·46	11 ×3½×·56	8 ×3 ×·40	7 ×3×·40
26	BULB ANGLES	9½×3½×·46	11½×3½×·50		9 ×3 ×·42	10½×3½×·54	12 ×3½×·52	8½×3 ×·44	7½×3×·42
28	BULB ANGLES	10 ×3½×·48	12 ×3½×·54		9½×3½×·44	11 ×3½×·56		9 ×3 ×·44	8 ×3×·42
30	BULB ANGLES	10½×3½×·50			10 ×3½×·44	12 ×3½×·56		9½×3½×·46	8 ×3×·46

* Where frames are spaced not more than 30 inches apart.

LLOYD'S REGISTER OF SHIPPING, LONDON.—12*th April*, 1923.

If I beams are fitted the thickness of the web should not be less than the thickness of the plate in the Tables.

HATCH WEBS.

TABLE A.

TABLE 36

(See Continuation.)

HATCHWAY BEAMS.

BREADTH OF HATCHWAY.	WITHOUT FORE AND AFTERS. Spacing Centre to Centre. Feet. 4	WITHOUT FORE AND AFTERS. Spacing Centre to Centre. Feet. 5	WITH FORE AND AFTERS. Spacing Centre to Centre. Feet. 6	WITH FORE AND AFTERS. Spacing Centre to Centre. Feet. 8	WITH FORE AND AFTERS. Spacing Centre to Centre. Feet. 10	ANGLES ON EDGES OF WEBS.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
10	9 × ·46 B.P.	10 × ·50 B.P.	11 × ·30	12 × ·32	14 × ·34	3 × 3 × ·40
12	11 × ·50 B.P.	12 × ·50 B.P.	12 × ·32	14 × ·34	17 × ·36	3 × 3 × ·40
14	12 × ·50 B.P.	12 × ·32	14 × ·34	17 × ·36	20 × ·38	3 × 3 × ·42
16	12 × ·32	14 × ·34	16 × ·36	19 × ·38	22 × ·38	3½ × 3 × ·42
18	14 × ·34	16 × ·36	18 × ·36	21 × ·38	25 × ·40	4 × 3 × ·44
20	15 × ·34	18 × ·36	20 × ·38	24 × ·40	28 × ·42	4 × 3 × ·44
22	16 × ·36	19 × ·36	22 × ·38	26 × ·42	30 × ·44	4½ × 3 × ·46
24	17 × ·36	20 × ·38	23 × ·40	28 × ·42	32 × ·44	5 × 3½ × ·46
26	18 × ·36	21 × ·38	24 × ·40	29 × ·42	34 × ·46	5½ × 3½ × ·48
28	19 × ·38	22 × ·38	25 × ·40	31 × ·44	36 × ·48	6 × 3½ × ·50
30	20 × ·38	23 × ·40	26 × ·42	32 × ·44	38 × ·48	6 × 3½ × ·52

The depths are measured from the top edge of uppermost mounting to lower edge of lower mounting at the middle of the beam.
The depth at the ends is to be one half of the depth at the middle, but in no case less than 6 inches.
The larger flanges of the mounting angles are to be fitted horizontally.

CENTRE FORE AND AFTERS.†

LENGTH OF FORE AND AFTER.	STEEL BULB PLATE. Spacing of Fore and Afters. Feet. 3	STEEL BULB PLATE. Spacing of Fore and Afters. Feet. 4	STEEL BULB PLATE. Spacing of Fore and Afters. Feet. 5	DOUBLE ANGLES ON UPPER EDGE.	WOOD. Spacing of Fore and Afters. Feet. 3		WOOD. Spacing of Fore and Afters. Feet. 4		WOOD. Spacing of Fore and Afters. Feet. 5	
Feet.	Inches.	Inches.	Inches.	Inches.	Depth. Inches.	Breadth. Inches.	Depth. Inches.	Breadth. Inches.	Depth. Inches.	Breadth. Inches.
6	6 × ·36	6½ × ·38	7 × ·38	2½ × 2½ × ·36	5½	7	6	7	6½	7
8	7 × ·42	8 × ·44	9 × ·44	2½ × 2½ × ·38	6½	7	7½	7	8	7
10	8 × ·50	9½ × ·50	11 × ·50	2½ × 2½ × ·40	8	7	8½	8	9	9

SIDE FORE AND AFTERS.†

LENGTH OF FORE AND AFTER.	STEEL BULB ANGLE. Spacing of Fore and Afters. Feet. 3	STEEL BULB ANGLE. Spacing of Fore and Afters. Feet. 4	STEEL BULB ANGLE. Spacing of Fore and Afters. Feet. 5	ANGLE ON UPPER EDGE OF BULB ANGLE.	WOOD. Spacing of Fore and Afters. Feet. 3		WOOD. Spacing of Fore and Afters. Feet. 4		WOOD. Spacing of Fore and Afters. Feet. 5	
Feet.	Inches.	Inches.	Inches.	Inches.	Depth. Inches.	Breadth. Inches.	Depth. Inches.	Breadth. Inches.	Depth. Inches.	Breadth. Inches.
6	6 × 3 × ·36	6½ × 3½ × ·38	7 × 3½ × ·38	2½ × 2½ × ·36	5½	5½	6	6	6½	6
8	7 × 3½ × ·42	8 × 3½ × ·44	9 × 3½ × ·44	2½ × 2½ × ·38	6½	6½	7½	7	8	7
10	8 × 3½ × ·50	9½ × 3½ × ·50	11 × 3½ × ·50	2½ × 2½ × ·40	8	7	8½	8	9	9

† Depths of fore and afters are measured to under side of covers, and the bulb plate of the centre fore and after is to be extended to the top of the wood covers.

HATCH WEBS.

TABLE B.

TABLE 36 *(Concluded.)*

HATCHWAY BEAMS.

BREADTH OF HATCHWAY.	WITHOUT FORE AND AFTERS. Spacing Centre to Centre.		WITH FORE AND AFTERS. Spacing Centre to Centre.			ANGLES ON EDGES OF WEBS.
	Feet. 4	Feet. 5	Feet. 6	Feet. 8	Feet. 10	
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
10	8 × ·40 B.P.	9 × ·44 B.P.	9½ × ·46 B.P.	10½ × ·50 B.P.	11½ × ·52 B.P.	3 × 3 × ·40
12	9 × ·44 B.P.	10 × ·50 B.P.	11 × ·50 B.P.	11 × ·30	13 × ·34	3 × 3 × ·40
14	10 × ·50 B.P.	11½ × ·50 B.P.	11 × ·30	13 × ·32	15 × ·34	3 × 3 × ·42
16	11 × ·30	11 × ·30	12 × ·32	15 × ·34	17 × ·36	3½ × 3 × ·42
18	11 × ·30	12 × ·32	14 × ·34	17 × ·36	19 × ·38	4 × 3 × ·44
20	12 × ·32	13 × ·34	16 × ·36	19 × ·38	21 × ·38	4 × 3 × ·44
22	12½ × ·32	14 × ·34	17 × ·36	20 × ·38	23 × ·40	4½ × 3 × ·46
24	13 × ·34	14½ × ·34	18 × ·36	21 × ·38	25 × ·40	5 × 3½ × ·46
26	13½ × ·34	15 × ·34	19 × ·38	22 × ·38	26 × ·42	5½ × 3½ × ·48
28	14 × ·34	16 × ·36	20 × ·38	23 × ·40	27 × ·42	6 × 3½ × ·50
30	15 × ·34	17 × ·36	21 × ·38	24 × ·40	28 × ·42	6 × 3½ × ·52

The depths are measured from the top edge of uppermost mounting to lower edge of lower mounting at the middle of the beam.
The depth at the ends is to be one half of the depth at the middle, but in no case less than 6 inches.
The larger flanges of the mounting angles are to be fitted horizontally.

CENTRE FORE AND AFTERS.†

LENGTH OF FORE AND AFTER.	STEEL BULB PLATE. Spacing of Fore and Afters.			DOUBLE ANGLES ON UPPER EDGE.	WOOD. Spacing of Fore and Afters.					
	Feet. 3	Feet. 4	Feet. 5		Feet. 3		Feet. 4		Feet. 5	
					Depth.	Breadth.	Depth.	Breadth.	Depth.	Breadth.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
6	5 × ·34	5½ × ·34	6 × ·36	2½ × 2½ × ·36	5	7	5½	7	6	7
8	6 × ·38	7 × ·40	7½ × ·42	2½ × 2½ × ·38	6	7	6½	7	7	7
10	7 × ·44	8 × ·46	9 × ·50	2½ × 2½ × ·40	7	7	7½	7	8	7

SIDE FORE AND AFTERS.†

LENGTH OF FORE AND AFTER.	STEEL BULB ANGLE. Spacing of Fore and Afters.			ANGLE ON UPPER EDGE OF BULB ANGLE.	WOOD. Spacing of Fore and Afters.					
	Feet. 3	Feet. 4	Feet. 5		Feet. 3		Feet. 4		Feet. 5	
					Depth.	Breadth.	Depth.	Breadth.	Depth.	Breadth.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
6	5 × 3 × ·34	5½ × 3 × ·34	6 × 3 × ·36	2½ × 2½ × ·36	5	5	5½	5	6	5
8	6 × 3 × ·38	7 × 3 × ·40	7½ × 3½ × ·42	2½ × 2½ × ·38	6	5	6½	6	7	6
10	7 × 3 × ·44	8 × 3½ × ·46	9 × 3½ × ·50	2½ × 2½ × ·40	7	6	7½	7	8	7

† Depths of fore and afters are measured to under side of covers, and the bulb plate of the centre fore and after is to be extended to the top of the wood covers.

LLOYD'S REGISTER OF SHIPPING, LONDON.—28*th October*, 1932.

EQUIVALENT SECTIONS in ASSOCIATION with PLATING. TABLE 37

ANGLES.	ANGLES.	BULB ANGLES.	BULB ANGLES.	CHANNELS.	CHANNELS.	CHANNELS.	CHANNELS.
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3 ×3×·40	3½×3×·30						
3½×3×·40	4 ×3×·32						
4 ×3×·40	4½×3×·32						
4½×3×·40	5 ×3×·32						
5 ×3×·40	5½×3×·32						
5½×3×·40	6 ×3×·34						
6 ×3×·40	6½×3×·34		5 ×3 ×·32				
6½×3×·40			5½×3 ×·32				
		5½×3 ×·44	6 ×3 ×·32				
		6 ×3 ×·44	6½×3 ×·32				
		6½×3 ×·46	7 ×3 ×·32				
		7 ×3 ×·48	7½×3 ×·34			6 ×3×3×·34	
		7½×3 ×·50	8 ×3½×·36	6 ×3½×3½×·42	6½×3½×3½×·32	6½×3×3×·40	7 ×3×3×·30
		8 ×3½×·50	8½×3½×·38	6½×3½×3½×·42	7 ×3½×3½×·32	7 ×3×3×·44	7½×3×3×·34
		8½×3½×·52	9 ×3½×·40	7 ×3½×3½×·48	7½×3½×3½×·36	7½×3×3×·46	8 ×3×3×·36
		9 ×3½×·54	9½×3½×·42	7½×3½×3½×·52	8 ×3½×3½×·40	8 ×3×3×·50	8½×3×3×·40
		9½×3½×·54	10 ×3½×·42	8 ×3½×3½×·54	8½×3½×3½×·42	8½×3×3×·52	9 ×3×3×·42
		10 ×3½×·54	10½×3½×·42	8½×3½×3½×·56	9 ×3½×3½×·46	9 ×3×3×·56	
		10½×3½×·54	11 ×3½×·42	9 ×3½×3½×·58	9½×3½×3½×·48		
		11 ×3½×·56	11½×3½×·44	9½×3½×3½×·62	10 ×3½×3½×·52		
		11½×3½×·56	12 ×3½×·46	10½×3½×3½×·56	11 ×3½×3½×·48		
		12 ×3½×·56		11 ×3½×3½×·56	11½×3½×3½×·48		
				12 ×3½×3½×·56	11½×3½×3½×·64		

HATCH WEBS.

TABLE B.

TABLE 36 *(Concluded.)*

WEB PLATE BEAMS.

BREADTH OF HATCHWAY.	WITHOUT FORE AND AFTERS. Spacing Centre to Centre. Feet. 4	WITHOUT FORE AND AFTERS. Spacing Centre to Centre. Feet. 5	WITH OR WITHOUT FORE AND AFTERS. Feet. 6	WITH FORE AND AFTERS. Spacing Centre to Centre. Feet. 8	WITH FORE AND AFTERS. Spacing Centre to Centre. Feet. 10	DOUBLE ANGLES ON UPPER AND LOWER EDGES OF WEBS.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
10	~~9 × ·30~~ ~~32~~ 8 × ·40 BP	~~9 × ·30~~ ~~32~~ 9 × ·44 BP	~~9 × ·30~~ ~~32~~ 9½ × ·46 BP	~~10 × ·30~~ ~~34~~ 10½ × ·50 BP	~~11 × ·32~~ ~~43~~ 11½ × ·52 BP	3 × 3 × ·40
12	~~9 × ·30~~ ~~32~~ 9 × ·44 BP	10 × ·30 ~~34~~ 10 × ·50 BP	~~10 × ·30~~ ~~34~~ 11 × ·50 BP	11 × ·30 42	13 × ·34 54	3 × 3 × ·40
14	~~10 × ·30~~ ~~38~~ 10 × ·50 BP	~~11 × ·30~~ ~~44~~ 11½ × ·50 BP	11 × ·30 44	13 × ·32 55	15 × ·34 68	3 × 3 × ·42
16	11 × ·30 48	~~12 × ·32~~ ~~54~~ 11 × 30	12 × ·32 54	15 × ·34 74	17 × ·36 89	3½ × 3 × ·42
18	11 × ·30 54	12 × ·32 61	14 × ~~·32~~ ~~76~~ ~~75~~ 34	17 × ·36 99	19 × ·38 116	4 × 3 × ·44
20	12 × ·32 61	13 × ·34 69	16 × ~~·34~~ ~~90~~ 91 36	19 × ·38 116	21 × ·38 132	4 × 3 × ·44
22	12½ × ·32 72	14 × ·34 84	17 × ·36 110	20 × ·38 124	23 × ·40 146	4½ × 3 × ·46
24	13 × ·34 83	14½ × ·34 96	18 × ·36 128	21 × ·38 158	25 × ·40 25	5 × 3½ × ·46
26	13½ × ·34 94	15 × ·34 111	19 × ·38 153	22 × ·38 185	26 × ·42 234	5½ × 3½ × ·48
28	14 × ·34 112	16 × ·36 133	20 × ·38 149	23 × ·40 215	27 × ·42 264	6 × 3½ × ·50
30	15 × ·34 126	17 × ·36 198	21 × ·38 195	24 × ·40 232	28 × ·42 284	6 × 3½ × ·52

The depths are measured from the top edge of uppermost mounting to lower edge of lower mounting at the middle of the beam.
The depth at the ends is to be one half of the depth at the middle, but in no case less than 6 inches.
The larger flanges of the mounting angles are to be fitted horizontally.

CENTRE FORE AND AFTERS.†

LENGTH OF FORE AND AFTER.	STEEL BULB PLATE. Spacing of Fore and Afters. Feet. 3	Feet. 4	Feet. 5	DOUBLE ANGLES ON UPPER EDGE.	WOOD. Spacing of Fore and Afters. Feet. 3 Depth.	Feet. 3 Breadth.	Feet. 4 Depth.	Feet. 4 Breadth.	Feet. 5 Depth.	Feet. 5 Breadth.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
6	5 × ·34	5½ × ·34	6 × ·36	2½ × 2½ × ·36	5	7	5½	7	6	7
8	6 × ·38	7 × ·40	7½ × ·42	2½ × 2½ × ·38	6	7	6½	7	7	7
10	7 × ·44	8 × ·46	9 × ·50	2½ × 2½ × ·40	7	7	7½	7	8	7

SIDE FORE AND AFTERS.†

LENGTH OF FORE AND AFTER.	STEEL BULB ANGLE. Spacing of Fore and Afters. Feet. 3	Feet. 4	Feet. 5	ANGLE ON UPPER EDGE OF BULB ANGLE.	WOOD. Spacing of Fore and Afters. Feet. 3 Depth.	Feet. 3 Breadth.	Feet. 4 Depth.	Feet. 4 Breadth.	Feet. 5 Depth.	Feet. 5 Breadth.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
6	5 × 3 × ·34	5½ × 3 × ·34	6 × 3 × ·36	2½ × 2½ × ·36	5	5	5½	5	6	5
8	6 × 3 × ·38	7 × 3 × ·40	7½ × 3 × ·42	2½ × 2½ × ·38	6	5	6½	6	7	6
10	7 × 3 × ·44	8 × 3½ × ·46	9 × 3½ × ·50	2½ × 2½ × ·40	7	6	7½	7	8	7

† Depths of fore and afters are measured to under side of covers, and the bulb plate of the centre fore and after is to be extended to the top of the wood covers.

EQUIVALENT SECTIONS in ASSOCIATION with PLATING. TABLE 37

ANGLES.	ANGLES.	BULB ANGLES.	BULB ANGLES.	CHANNELS.	CHANNELS.	CHANNELS.	CHANNELS.
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3 ×3×·40	3½×3×·30						
3½×3×·40	4 ×3×·32						
4 ×3×·40	4½×3×·32						
4½×3×·40	5 ×3×·32						
5 ×3×·40	5½×3×·32						
5½×3×·40	6 ×3×·34						
6 ×3×·40	6½×3×·34		5 ×3 ×·32				
6½×3×·40			5½×3 ×·32				
		5½×3 ×·44	6 ×3 ×·32				
		6 ×3 ×·44	6½×3 ×·32				
		6½×3 ×·46	7 ×3 ×·32				
		7 ×3 ×·48	7½×3 ×·34			6 ×3×3×·34	
		7½×3 ×·50	8 ×3½×·36	6 ×3½×3½×·42	6½×3½×3½×·32	6½×3×3×·40	7 ×3×3×·30
		8 ×3½×·50	8½×3½×·38	6½×3½×3½×·42	7 ×3½×3½×·32	7 ×3×3×·44	7½×3×3×·34
		8½×3½×·52	9 ×3½×·40	7 ×3½×3½×·48	7½×3½×3½×·36	7½×3×3×·46	8 ×3×3×·36
		9 ×3½×·54	9½×3½×·42	7½×3½×3½×·52	8 ×3½×3½×·40	8 ×3×3×·50	8½×3×3×·40
		9½×3½×·54	10 ×3½×·42	8 ×3½×3½×·54	8½×3½×3½×·42	8½×3×3×·52	9 ×3×3×·42
		10 ×3½×·54	10½×3½×·42	8½×3½×3½×·56	9 ×3½×3½×·46	9 ×3×3×·56	
		10½×3½×·54	11 ×3½×·42	9 ×3½×3½×·58	9½×3½×3½×·48		
		11 ×3½×·56	11½×3½×·44	9½×3½×3½×·62	10 ×3½×3½×·52		
		11½×3½×·56	12 ×3½×·46	10½×3½×3½×·56	11 ×3½×3½×·48		
		12 ×3½×·56		11 ×3½×3½×·56	11½×3½×3½×·48		
				12 ×3½×3½×·56	11½×3½×3½×·64		

DIAMETERS and SPACING of RIVETS and BREADTHS of BUTT STRAPS, END LAPS and SEAMS. TABLE 38

		Inches. Not exceeding 9 ·36	Inches. Above 9 ·36 and not exceeding 12·5 ·50	Inches. Above 12·5 ·50 and not exceeding 18·5 ·72	Inches. Above 18·5 ·72 and not exceeding 24 ·94	Inches. Above 24 ·94 and not exceeding 29 1·14	Inches. Above 29 1·14 to 32 1·26
Thickness of Plates							
Diameter of Rivets		16 $\frac{5}{8}$	19 $\frac{3}{4}$	22 $\frac{7}{8}$	25 1	29 $1\frac{1}{8}$	32 $1\frac{1}{4}$
Breadth of Quadruple riveted Butt Straps in inches		—	—	22 560	25	$28\frac{1}{4}$	$31\frac{1}{2}$
Breadth of Treble riveted Butt Straps in inches ...		—	$14\frac{1}{4}$	$16\frac{3}{4}$	19	$21\frac{1}{2}$	24
Breadth of Double riveted Butt Straps in inches ...		8	$9\frac{3}{4}$ 250	$11\frac{1}{4}$ 285	—	—	—
Breadth of Single riveted Butt Straps in inches ...		$4\frac{1}{2}$ 115	$5\frac{1}{4}$ 135	—	—	—	—
Breadth of Quintuple riveted End Laps in inches ...		—	—	15 380	$17\frac{1}{2}$	20	$22\frac{1}{2}$
Breadth of Quadruple riveted End Laps in inches ...		—	—	12 305	14	16	18
Breadth of Treble riveted End Laps in inches ...		6 150	$7\frac{1}{2}$ 190	9 230	$10\frac{1}{2}$	12	$13\frac{1}{2}$
Breadth of Double riveted End Laps in inches ...		$4\frac{1}{4}$ 110	5 125	6 150	—	—	—
Breadth of Single riveted End Laps in inches ...		$2\frac{1}{2}$ 65	3 75	—	—	—	—
Breadth of Treble riveted Seams in inches		—	—	—	$8\frac{1}{2}$ 215	$9\frac{1}{2}$ 240	$10\frac{1}{2}$ 265
Breadth of Double riveted Seams in inches		$3\frac{3}{4}$ 95	$4\frac{1}{2}$ 115	$5\frac{1}{4}$ 135	6 150	$6\frac{3}{4}$ 140	$7\frac{1}{2}$ 190
Breadth of Single riveted Seams in inches		$2\frac{1}{4}$ 55	$2\frac{1}{2}$ 65	3 75	—	Laps and Seams in bridge —	—
MAXIMUM SPACING FROM CENTRE TO CENTRE. $3\frac{1}{2}$ diam. c. to c.	In End Connections of Shell Plating and all Deck Stringer Plates (except in Quintuple and Quadruple Riveted End Laps)	$2\frac{1}{4}$ 55	$2\frac{5}{8}$ 65	$3\frac{1}{8}$ 80	$3\frac{1}{2}$ 90	4 100	$4\frac{3}{8}$ 110
4 diam. c. to c.	In Seams of Shell Plating (forward and aft); Quadruple Riveted End Laps and Double Butt Straps; End Laps of Deck Plating, Margin Plates, Girders, Tie Plates and Floor Plates; End Laps and Seams of Inner Bottom Plating 15% of length at ends to be taken	$2\frac{1}{2}$ 65 also ends between where oil fuel is carried and laps of butts Tunnel Passage	3 75	$3\frac{1}{2}$ 90	4 100	$4\frac{1}{2}$ 115	5 125
$4\frac{1}{2}$ diam. c. to c.	In Quintuple Riveted End Laps; in Seams of Deck Plating; in Seams and End Connections of Bulkhead and Tunnel Plating, in Weather Deck Stringer Angles, Margin Plate Angles; Angles connecting Side Stringers to Web Frames, Flange of W.T. Bulkhead Frames to Bulkhead..	$2\frac{3}{4}$ 70	$3\frac{3}{8}$ 85	4 100	$4\frac{1}{2}$ 115	—	—
5 diam. c. to c.	In Flat Keel Angles, Vertical Angles connecting Floors and Centre Girder, Flange of W.T. Bulkhead Frames to Shell, Deck and Inner Bottom, End Connections and Edges of Mast Plates, Floors and Cross Ties in After Peak ..	$3\frac{1}{8}$ 80 Intercostal angles connecting deck girders to shell plating Butts of angles	$3\frac{3}{4}$ 95 of coal bunkers	$4\frac{3}{8}$ 110 Seams of Main Tubular Bulkhead	5 125	$5\frac{5}{8}$ 145 Foundation angles above tops of beams & cross ties in bunkers	$6\frac{1}{4}$ 160
$5\frac{1}{2}$ diam. c. to c.	In side frames whose spacing exceeds $34\frac{1}{2}$ inches .. .. In both Flanges of the Frames connecting Floors to Shell Plating in Steamers Forward of the three-fifths Midship Length, in the Shell Flange of Frames in Deep Tanks, Fore Peak Tanks and After Peak Tanks	$3\frac{1}{2}$ 90	$4\frac{1}{8}$ 105	$4\frac{7}{8}$ 125	$5\frac{1}{2}$ 140	$6\frac{1}{8}$ 155	$6\frac{7}{8}$ 175
6 diam. c. to c.	In Beams fitted at alternate Frames; in bottom frames to shell plating whose spacing exceeds $34\frac{1}{2}$ inches .. In side frames whose spacing exceeds $31\frac{1}{2}$ inches but does not exceed $34\frac{1}{2}$ inches .. .. Stiffs on deck head over fuel tanks	$3\frac{3}{4}$ 95	$4\frac{1}{2}$ 115	$5\frac{1}{4}$ 135	—	Section of pontoon angles & deck plate where not adjacent to bunker of butts where not considered. —	—
$6\frac{1}{2}$ diam. c. to c.	In side frames whose spacing exceeds $28\frac{1}{2}$ inches but does not exceed $31\frac{1}{2}$ inches; in bottom frames to shell plating whose spacing exceeds $31\frac{1}{2}$ inches but does not exceed $34\frac{1}{2}$ inches Spacing in wake of propeller	4 100	$4\frac{7}{8}$ 125	$5\frac{3}{4}$ 145	$6\frac{1}{2}$ 165	—	—
7 diam. c. to c.	In side frames whose spacing does not exceed $28\frac{1}{2}$ inches, in bottom frames to shell plating whose spacing does not exceed $31\frac{1}{2}$ inches; in bottom frames to floors; in reversed frames both to floors and to inner bottom, Floors, Keelsons, Beams except where fitted at alternate Frames, Deck and Hold Stringer Angles, Face Angles on Web Frames and Side Stringers, Bulkhead Stiffeners, Longitudinal Angles on continuous Girders, Vertical Angles connecting Floors and Side Girders, top and bottom Hatch Web Angles	$4\frac{1}{2}$ 115	$5\frac{1}{4}$ 135	$6\frac{1}{4}$ 160	7 180	Stiffs & underneath plating —	—

For spacing of rivets where frame spacing is increased to 30" & 36" See Sec 14 p 89.

RIVETING of END LAPS and SEAMS. TABLE 39

ITEM.	THICKNESS OF PLATES IN INCHES.											
	Not exceeding ·36	Above ·36 and not exceeding ·38	Above ·38 and not exceeding ·42	Above ·42 and not exceeding ·48	Above ·48 and not exceeding ·54	Above ·54 and not exceeding ·60	Above ·60 and not exceeding ·68	Above ·68 and not exceeding ·76	Above ·76 and not exceeding ·84	Above ·84 and not exceeding ·94	Above ·94 and not exceeding 1·04	Above 1·04 to 1·26
a	Double.	Double.	Treble.	Treble.	Treble.	Treble.	Quadruple.	Quadruple.	Quadruple.	Quintuple.	Quintuple.	Quintuple.
b	"	Treble.	"	"	"	"	Treble.	"	"	Quadruple.	Quadruple.	"
c	"	Double.	Double.	"	"	"	"	Treble.	"	"	"	Quadruple.
d	"	"	"	"	"	"	"	Quadruple.	"	"	"	
e	"	"	"	Double.	"	"	"	"	"	"	"	
f	Single.	Single.	Single.	"	Double.	"	"	"	"			
g	"	Double.	Double.	"	"	Double.	Double.	Double.	Double	Double.	Double.	
h	"	Single.	Single.	Single.	"	"	"	"	"	Treble.	Treble.	
i	"	"	"	"	Single.	Single.	Single.	"	"			
j	"	"	"	"	Double.	Double.	Double.	"	"			

The diameter of the rivets used for attachments is to be regulated by the greater thickness of the parts to be connected.
Treble riveted double butt straps may be fitted as an alternative to the quintuple riveted end laps required by the Table.

Riveting Requirements for End Laps.

a. End laps of sheer strake, strake below and stringer plates of the upper deck or "long" bridge for half the vessel's length amidships.

End laps of shell plating from keel to upper turn of bilge for half the vessel's length amidships.

End laps of boss plates.

End laps of centre girder plates in double bottoms.

End laps of floor plates and web frames.

b. End laps of flat keel plates for half the vessel's length amidships.

c. End laps of flat keel plates at ends of vessel.

d. End laps of shell plating from upper turn of bilge to strake below sheerstrake.

End laps of shell plating from keel to upper turn of bilge at ends of vessels.

End laps of sheerstrake, strake below and stringer plates of the upper deck at ends of vessel.

End laps of beam stringer plates of 2nd deck and decks or tiers of beams below.

End laps of tie plates.

End laps of margin plates and middle line strake of double bottoms for half the vessel's length amidships.

End laps of vertical keelson plates, rider plates, and foundation plates.

e. End laps of decks for half the vessel's length amidships.

End laps of inner bottom plating for half the vessel's length amidships.

End laps of side girders in double bottoms.

End laps of margin plates and middle line strake of double bottoms at ends of vessel.

f. End laps of deck plates at ends of vessel.

End laps of inner bottom plating at ends of double bottoms.

Riveting Requirements for Seams.

The edge attachments of shell plating, all fore and aft, are to be regulated by the thickness of the plating amidships.

g. Seams of shell plating from keel to upper turn of bilge.

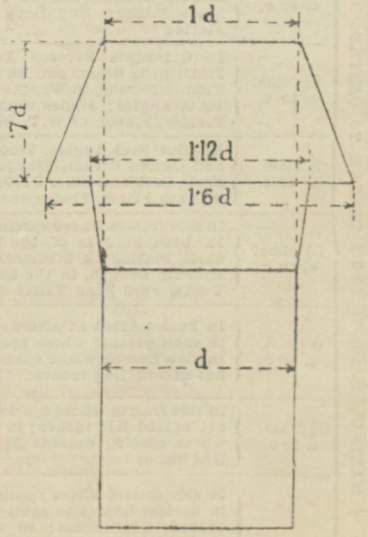
h. Seams of shell plating from upper turn of bilge.

The riveting of seams of shell plating is to be in accordance with **Section 30 clause 5.**

i. Seams of deckplates.

j. Seams of inner bottom plating.

STANDARD FORM OF RIVET.



The tapered neck of Rivet to be of suitable length in relation to the thickness of plate in which it is intended to be used.

Number of RIVETS in SEAMS of PLATING between FRAMES and BEAMS AMIDSHIPS excluding RIVETS in FRAMES and BEAMS. TABLE 40

SPACING OF FRAMES IN INCHES.	THICKNESS OF SHELL PLATING IN INCHES.						THICKNESS OF DECK PLATING IN INCHES.					THICKNESS OF INNER BOTTOM PLATING IN INCHES.		
	Not exceeding ·36	Above ·36 and not exceeding ·50	Above ·50 and not exceeding ·72	Above ·72 and not exceeding ·94	Above ·94 and not exceeding 1·14	Above 1·14 to 1·26	Not exceeding ·36	Above ·36 and not exceeding ·50	Above ·50 and not exceeding ·72	Above ·72 and not exceeding ·94	Above ·94 to 1·14	Not exceeding ·36	Above ·36 and not exceeding ·50	Above ·50 and not exceeding ·72
	Diameter of Rivet in inches.						Diameter of Rivet in inches.					Diameter of Rivet in inches.		
	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$
	Number of Rivets in each Row.						Number of Rivets in each Row.					Number of Rivets in each Row.		
20	7	6					6	5				7	6	
$20\frac{1}{2}$	7	6					7	5				7	6	
21	7	6	5				7	5				7	6	5
$21\frac{1}{2}$		6	5				7	6	5			7	6	5
22		6	5				7	6	5			8	6	5
$22\frac{1}{2}$		6	5				7	6	5			8	6	5
23		7	6	5			7	6	5			8	7	6
$23\frac{1}{2}$		7	6	5			8	6	5			8	7	6
24		7	6	5			8	6	5	5		8	7	6
$24\frac{1}{2}$			6	5				6	5	5		9	7	6
25			6	5	5			7	6	5		9	7	6
$25\frac{1}{2}$			7	6	5			7	6	5			7	7
26			7	6	5			7	6	5			8	7
$26\frac{1}{2}$			7	6	5			7	6	5			8	7
27			7	6	5			7	6	5	5		8	7
$27\frac{1}{2}$			7	6	6			7	6	5	5		8	7
28			7	6	6	5		7	6	5	5		8	7
$28\frac{1}{2}$			7	6	6	5			6	6	5		8	7
29			8	7	6	5			7	6	5			8
$29\frac{1}{2}$			8	7	6	5			7	6	5			8
30			8	7	6	5			7	6	5			8
$30\frac{1}{2}$			8	7	6	5			7	6	5			8
31			8	7	6	5			7	6	5			8
$31\frac{1}{2}$			8	7	6	6			7	6	6			8
32			8	7	7	6			7	6	6			8
$32\frac{1}{2}$			8	8	7	6			7	6	6			8
33			9	8	7	6			8	7	6			9
$33\frac{1}{2}$			9	8	7	6			8	7	6			9
34			9	8	7	6			8	7	6			9
$34\frac{1}{2}$			9	8	7	6			8	7	6			9
35			9	8	7	6			8	7	6			9
$35\frac{1}{2}$			9	8	7	6			8	7	6			9
36			9	8	7	6			8	7	6			9
$36\frac{1}{2}$			9	8	7	6			8	7	6			9
37			10	9	8	7			9	8	7			10
$37\frac{1}{2}$			10	9	8	7			9	8	7			10
38			10	9	8	7			9	8	7			10
$38\frac{1}{2}$			10	9	8	7			9	8	7			10
39			10	9	8	7			9	8	7			10

Pintles of double plate rudders are to be spaced as required for single plate rudders having arms at each pintle.

DOUBLE PLATE RUDDERS. TABLE 44

Depth of Stern frame gudgeons

DIAMETER OF RUDDER HEAD AS PER TABLE 41.	DIAMETER OF PINTLES.	SECTION OF MAINPIECE AT HEEL.	MINIMUM DIMENSIONS OF BOW AND STAYS.	THICKNESS OF PLATES.	DIAMETER OF RIVETS SPACED 5 DIAMETERS APART FROM CENTRE TO CENTRE.
Inches.	Inches.	Inches. *	Inches.	Inches.	Inches.
$2\frac{3}{4}$	2	2 × $1\frac{3}{4}$	2 × $\frac{7}{8}$	·24	$\frac{3}{4}$
3	2	2 × 2	2 × $\frac{7}{8}$	·24	$\frac{3}{4}$
$3\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$ × 2	$2\frac{1}{4}$ × $\frac{7}{8}$	·24	$\frac{3}{4}$
$3\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{2}$ × 2	$2\frac{1}{4}$ × $\frac{7}{8}$	·26	$\frac{3}{4}$
$3\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$ × $2\frac{1}{4}$	$2\frac{1}{2}$ × $\frac{7}{8}$	·26	$\frac{3}{4}$
4	$2\frac{1}{2}$	$2\frac{3}{4}$ × $2\frac{1}{4}$	$2\frac{1}{2}$ × 1	·26	$\frac{3}{4}$
$4\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$ × $2\frac{1}{2}$	$2\frac{1}{2}$ × 1	·26	$\frac{3}{4}$
$4\frac{1}{2}$	$2\frac{3}{4}$	3 × $2\frac{3}{4}$	$2\frac{1}{2}$ × $1\frac{1}{8}$	·28	$\frac{3}{4}$
$4\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{4}$ × $2\frac{3}{4}$	$2\frac{3}{4}$ × $1\frac{1}{8}$	·28	$\frac{3}{4}$
5	3	$3\frac{1}{4}$ × 3	$2\frac{3}{4}$ × $1\frac{1}{4}$	·28	$\frac{7}{8}$
$5\frac{1}{4}$	3	$3\frac{1}{2}$ × 3	$2\frac{3}{4}$ × $1\frac{1}{4}$	·28	$\frac{7}{8}$
$5\frac{1}{2}$	3	4 × 3	$2\frac{3}{4}$ × $1\frac{3}{8}$	·30	$\frac{7}{8}$
$5\frac{3}{4}$	3	$4\frac{1}{4}$ × 3	3 × $1\frac{3}{8}$	·30	$\frac{7}{8}$
6	3	$4\frac{1}{2}$ × 3	3 × $1\frac{1}{2}$	·30	$\frac{7}{8}$
$6\frac{1}{4}$	$3\frac{1}{4}$	$4\frac{3}{4}$ × $3\frac{1}{4}$	3 × $1\frac{1}{2}$	·30	$\frac{7}{8}$
$6\frac{1}{2}$	$3\frac{1}{4}$	5 × $3\frac{1}{4}$	3 × $1\frac{5}{8}$	·32	$\frac{7}{8}$
$6\frac{3}{4}$	$3\frac{1}{2}$	$5\frac{1}{4}$ × $3\frac{1}{2}$	$3\frac{1}{4}$ × $1\frac{5}{8}$	·32	$\frac{7}{8}$
7	$3\frac{1}{2}$	$5\frac{1}{2}$ × $3\frac{1}{2}$	$3\frac{1}{4}$ × $1\frac{3}{4}$	·32	$\frac{7}{8}$
$7\frac{1}{4}$	$3\frac{1}{2}$	6 × $3\frac{1}{2}$	$3\frac{1}{2}$ × $1\frac{3}{4}$	·34	$\frac{7}{8}$
$7\frac{1}{2}$	$3\frac{3}{4}$	$6\frac{1}{4}$ × $3\frac{3}{4}$	$3\frac{1}{2}$ × $1\frac{7}{8}$	·34	$\frac{7}{8}$

* The figures in this column are to be the fore and aft dimensions.

STEERING CHAINS, RODS, QUADRANTS and TILLERS. TABLE 45

DIAMETER OF RUDDER STOCK	RADIUS OF QUADRANT	Diameter of Pintle	Diameter of Gudgeon	BOSS OF QUADRANT.		QUADRANTS AND TILLERS.		
				Depth.	Outside Diameter.	Sizes of Arms at Twice the Diameter of Rudder Head from Centre of Rudder Head.		
						One Arm.	Two Arms.	Three Arms.
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
11½	7— 4	$1\frac{5}{8}$	2	$2\frac{3}{4}$	$5\frac{1}{4}$			
12	8— 0	$1\frac{5}{8}$	2	3	$5\frac{1}{2}$			
12½	8— 0			$3\frac{1}{4}$	$5\frac{3}{4}$			
13	8— 0	$d = .38\sqrt{\frac{D^3}{R}}$		$3\frac{1}{2}$	$6\frac{1}{4}$			
13½	8— 0			$3\frac{3}{4}$	$6\frac{3}{4}$			
14	8— 0			4	$7\frac{1}{4}$			
14½	8— 0			$4\frac{1}{4}$	$7\frac{1}{2}$			
15	8— 0			$4\frac{1}{2}$	8			
				$4\frac{3}{4}$	$8\frac{1}{2}$			
				5	9			
				$5\frac{1}{4}$	$9\frac{1}{4}$			
				$5\frac{1}{2}$	$9\frac{3}{4}$			
				$5\frac{3}{4}$	$10\frac{1}{4}$			
				6	$10\frac{3}{4}$			
				$6\frac{1}{4}$	$11\frac{1}{4}$			
				$6\frac{1}{2}$	$11\frac{3}{4}$			
				$6\frac{3}{4}$	12			
				7	$12\frac{1}{2}$			
				$7\frac{1}{4}$	13			
				$7\frac{1}{2}$	$13\frac{1}{2}$			
				$7\frac{3}{4}$	14			
				8	$14\frac{1}{2}$			
				$8\frac{1}{2}$	$15\frac{1}{4}$			
				9	$16\frac{1}{4}$			
				$9\frac{1}{2}$	17			
				10	18			
				$10\frac{1}{2}$	19			
				11	$19\frac{3}{4}$			
				$11\frac{1}{2}$	$20\frac{3}{4}$			
				12	$21\frac{1}{2}$			
				$12\frac{1}{2}$	$22\frac{1}{2}$			
				13	$23\frac{1}{2}$			
				$13\frac{1}{2}$	$24\frac{1}{2}$			
				14	$25\frac{1}{4}$			
				$14\frac{1}{2}$	$26\frac{1}{4}$			
				15	27			

Pintles of double plate rudders are to be spaced as required for single plate rudders having arms at each pintle.

DOUBLE PLATE RUDDERS. TABLE 44

Depth of Sternframe gudgeons

DIAMETER OF RUDDER HEAD AS PER TABLE 41.	DIAMETER OF PINTLES.	SECTION OF MAINPIECE AT HEEL.	MINIMUM DIMENSIONS OF BOW AND STAYS.	THICKNESS OF PLATES.	DIAMETER OF RIVETS SPACED 5 DIAMETERS
Inches.	Inches.	Inches. *	Inches.		
$2\frac{3}{4}$	2	2 × $1\frac{3}{4}$	2 × $\frac{7}{8}$		
3	2	2 × 2	2 × $\frac{7}{8}$		
$3\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$ × 2	$2\frac{1}{4}$ × $\frac{7}{8}$		
$3\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{2}$ × 2	$2\frac{1}{4}$ × $\frac{7}{8}$		
$3\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$ × $2\frac{1}{4}$	$2\frac{1}{2}$ × $\frac{7}{8}$		
4	$2\frac{1}{2}$	$2\frac{3}{4}$ × $2\frac{1}{4}$	$2\frac{1}{2}$ × 1		
$4\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$ × $2\frac{1}{2}$	$2\frac{1}{2}$ × 1		
$4\frac{1}{2}$	$2\frac{3}{4}$	3 × $2\frac{3}{4}$	$2\frac{1}{2}$ × $1\frac{1}{8}$		
$4\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{4}$ × $2\frac{3}{4}$	$2\frac{3}{4}$ × $1\frac{1}{8}$		
5	3	$3\frac{1}{4}$ × 3	$2\frac{3}{4}$ × $1\frac{1}{4}$		
$5\frac{1}{4}$	3	$3\frac{1}{2}$ × 3	$2\frac{3}{4}$ × $1\frac{1}{4}$		
$5\frac{1}{2}$	3	4 × 3	$2\frac{3}{4}$ × $1\frac{3}{8}$		
$5\frac{3}{4}$	3	$4\frac{1}{4}$ × 3	3 × $1\frac{3}{8}$		
6	3	$4\frac{1}{2}$ × 3	3 × $1\frac{1}{2}$		
$6\frac{1}{4}$	$3\frac{1}{4}$	$4\frac{3}{4}$ × $3\frac{1}{4}$	3 × $1\frac{1}{2}$		
$6\frac{1}{2}$	$3\frac{1}{4}$	5 × $3\frac{1}{4}$	3 × $1\frac{5}{8}$	·32	$\frac{7}{8}$
$6\frac{3}{4}$	$3\frac{1}{2}$	$5\frac{1}{4}$ × $3\frac{1}{2}$	$3\frac{1}{4}$ × $1\frac{5}{8}$	·32	$\frac{7}{8}$
7	$3\frac{1}{2}$	$5\frac{1}{2}$ × $3\frac{1}{2}$	$3\frac{1}{4}$ × $1\frac{3}{4}$	·32	$\frac{7}{8}$
$7\frac{1}{4}$	$3\frac{1}{2}$	6 × $3\frac{1}{2}$	$3\frac{1}{2}$ × $1\frac{3}{4}$	·34	$\frac{7}{8}$
$7\frac{1}{2}$	$3\frac{3}{4}$	$6\frac{1}{4}$ × $3\frac{3}{4}$	$3\frac{1}{2}$ × $1\frac{7}{8}$	·34	$\frac{7}{8}$

EXTREME LENGTH. (See Footnote.)		PARTNERS. Diam.	PARTNERS. Thickness. Iron.	PARTNERS. Thickness. Steel.	HEEL. Diam.	HEEL. Thick. Iron.
	Ft.	ins.	ins.	ins.	ins.	ins.
Two Plates in the Round.	48	16	$\frac{5}{16}$	$\frac{6}{20}$	13	$\frac{4}{16}$
	51	17	$\frac{5}{16}$	$\frac{6}{20}$	$13\frac{1}{2}$	$\frac{4}{16}$
	54	18	$\frac{5}{16}$	$\frac{6}{20}$	14	$\frac{4}{16}$
	57	19	$\frac{6}{16}$	$\frac{7}{20}$	15	$\frac{5}{16}$
	60	20	$\frac{6}{16}$	$\frac{7}{20}$	16	$\frac{5}{16}$
	63	21	$\frac{6}{16}$	$\frac{7}{20}$	$16\frac{1}{2}$	$\frac{5}{16}$
	66	22	$\frac{6}{16}$	$\frac{7}{20}$	17	$\frac{5}{16}$
	69	23	$\frac{6}{16}$	$\frac{7}{20}$	18	$\frac{5}{16}$
	72	24	$\frac{6}{16}$	$\frac{7}{20}$	19	$\frac{5}{16}$
Three Plates in the Round.	75	25	$\frac{7}{16}$	$\frac{8}{20}$	$19\frac{1}{2}$	$\frac{6}{16}$
	78	26	$\frac{7}{16}$	$\frac{8}{20}$	20	$\frac{6}{16}$
	81	27	$\frac{8}{16}$	$\frac{9}{20}$	21	$\frac{6}{16}$
	84	28	$\frac{8}{16}$	$\frac{9}{20}$	22	$\frac{6}{16}$
	87	29	$\frac{8}{16}$	$\frac{9}{20}$	$22\frac{1}{2}$	$\frac{6}{16}$
	90	30	$\frac{8}{16}$	$\frac{9}{20}$	23	$\frac{7}{16}$
	93	31	$\frac{9}{16}$	$\frac{10}{20}$	24	$\frac{7}{16}$
	96	32	$\frac{9}{16}$	$\frac{10}{20}$	25	$\frac{7}{16}$

LENGTH OUTSIDE BED.	BED. Diam.	BED. Th'kn'ss Irn.	BED. Th'kn'ss Stl.	...L. Diam.	...L. Th'kn'ss Irn.	...L. Th'kn'ss Stl.	CAP Diam.	CAP T... Ir...
Ft.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	in...
14	16	$\frac{5}{8}$	$\frac{6}{8}$	14	$\frac{5}{8}$	$\frac{6}{8}$	12	

* The figures in this column are to be the fore and aft dimensions.

STEERING CHAINS, RODS, QUADRANTS and TILLERS. TABLE 45

DIAMETER OF RUDDER HEAD AS PER TABLE 41	RADIUS OF QUADRANT.	Diameter of Chains.	Diameter of Rods.	BOSS OF QUADRANT.		QUADRANTS AND TILLERS. Sizes of Arms at Twice the Diameter of Rudder Head from Centre of Rudder Head.		
				Depth.	Outside Diameter.	One Arm.	Two Arms.	Three Arms.
Inches.	Feet. Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
$2\frac{3}{4}$	2—10	$\frac{3}{8}$	$\frac{1}{2}$	$2\frac{3}{4}$	$5\frac{1}{4}$	$3\frac{1}{4} \times 1\frac{7}{8}$		
3	3— 0	$\frac{7}{16}$	$\frac{1}{2}$	3	$5\frac{1}{2}$	$3\frac{1}{4} \times 2$		
$3\frac{1}{4}$	3— 0	$\frac{1}{2}$	$\frac{9}{16}$	$3\frac{1}{4}$	$5\frac{3}{4}$	$3\frac{1}{4} \times 2\frac{1}{4}$		
$3\frac{1}{2}$	3— 2	$\frac{9}{16}$	$\frac{5}{8}$	$3\frac{1}{2}$	$6\frac{1}{4}$	$3\frac{1}{2} \times 2\frac{1}{2}$		
$3\frac{3}{4}$	3— 2	$\frac{9}{16}$	$\frac{5}{8}$	$3\frac{3}{4}$	$6\frac{3}{4}$	$4 \times 2\frac{1}{2}$		
4	3— 4	$\frac{5}{8}$	$\frac{11}{16}$	4	$7\frac{1}{4}$	$4\frac{1}{4} \times 2\frac{1}{2}$		
$4\frac{1}{4}$	3— 4	$\frac{11}{16}$	$\frac{3}{4}$	$4\frac{1}{4}$	$7\frac{1}{2}$	$4\frac{1}{2} \times 2\frac{3}{4}$		
$4\frac{1}{2}$	3— 6	$\frac{11}{16}$	$\frac{3}{4}$	$4\frac{1}{2}$	8	$5 \times 2\frac{3}{4}$	$3\frac{3}{4} \times 2\frac{1}{4}$	
$4\frac{3}{4}$	3— 6	$\frac{12}{16}$	$\frac{13}{16}$	$4\frac{3}{4}$	$8\frac{1}{2}$	$5\frac{1}{4} \times 2\frac{3}{4}$	$4 \times 2\frac{1}{4}$	
5	3— 8	$\frac{12}{16}$	$\frac{13}{16}$	5	9	$5\frac{1}{2} \times 3$	$4\frac{1}{4} \times 2\frac{1}{2}$	
$5\frac{1}{4}$	3— 8	$\frac{13}{16}$	$\frac{14}{16}$	$5\frac{1}{4}$	$9\frac{1}{4}$	$5\frac{3}{4} \times 3$	$4\frac{1}{2} \times 2\frac{1}{2}$	
$5\frac{1}{2}$	3—10	$\frac{13}{16}$	$\frac{15}{16}$	$5\frac{1}{2}$	$9\frac{3}{4}$	$6 \times 3\frac{1}{4}$	$4\frac{3}{4} \times 2\frac{1}{2}$	
$5\frac{3}{4}$	3—10	$\frac{7}{8}$	$\frac{15}{16}$	$5\frac{3}{4}$	$10\frac{1}{4}$	$6\frac{1}{4} \times 3\frac{1}{4}$	$5 \times 2\frac{1}{2}$	
6	4— 0	$\frac{7}{8}$	1	6	$10\frac{3}{4}$	$6\frac{1}{2} \times 3\frac{1}{2}$	$5\frac{1}{4} \times 2\frac{3}{4}$	
$6\frac{1}{4}$	4— 0	$1\frac{5}{16}$	$1\frac{1}{16}$	$6\frac{1}{4}$	$11\frac{1}{4}$	$6\frac{3}{4} \times 3\frac{1}{2}$	$5\frac{1}{2} \times 2\frac{3}{4}$	
$6\frac{1}{2}$	4— 2	$1\frac{5}{16}$	$1\frac{1}{16}$	$6\frac{1}{2}$	$11\frac{3}{4}$	$7 \times 3\frac{3}{4}$	$5\frac{1}{2} \times 3$	
$6\frac{3}{4}$	4— 2	1	$1\frac{1}{8}$	$6\frac{3}{4}$	12	$7\frac{1}{4} \times 3\frac{3}{4}$	$5\frac{3}{4} \times 3$	
7	4— 4	1	$1\frac{1}{4}$	7	$12\frac{1}{2}$	$7\frac{1}{2} \times 4$	$6 \times 3\frac{1}{4}$	
$7\frac{1}{4}$	4— 4	$1\frac{1}{16}$	$1\frac{1}{4}$	$7\frac{1}{4}$	13	$7\frac{3}{4} \times 4\frac{1}{4}$	$6 \times 3\frac{1}{4}$	
$7\frac{1}{2}$	4— 6	$1\frac{1}{16}$	$1\frac{5}{16}$	$7\frac{1}{2}$	$13\frac{1}{2}$	$8 \times 4\frac{1}{2}$	$6\frac{1}{4} \times 3\frac{1}{2}$	
$7\frac{3}{4}$	4— 6	$1\frac{1}{8}$	$1\frac{3}{8}$	$7\frac{3}{4}$	14	$8\frac{1}{4} \times 4\frac{1}{2}$	$6\frac{1}{4} \times 3\frac{3}{4}$	
8	4— 8	$1\frac{3}{16}$	$1\frac{3}{8}$	8	$14\frac{1}{2}$	$8\frac{1}{2} \times 4\frac{3}{4}$	$6\frac{1}{2} \times 4$	$5\frac{3}{4} \times 3\frac{1}{2}$
$8\frac{1}{2}$	5— 0	$1\frac{1}{4}$	$1\frac{1}{2}$	$8\frac{1}{2}$	$15\frac{1}{4}$	9×5	7×4	$6 \times 3\frac{3}{4}$
9	5— 4	$1\frac{5}{16}$	$1\frac{9}{16}$	9	$16\frac{1}{4}$	$9\frac{1}{2} \times 5\frac{1}{4}$	$7\frac{1}{2} \times 4\frac{1}{4}$	$6\frac{1}{2} \times 3\frac{3}{4}$
$9\frac{1}{2}$	5— 8	$1\frac{3}{8}$	$1\frac{11}{16}$	$9\frac{1}{2}$	17	$10 \times 5\frac{3}{4}$	$8 \times 4\frac{1}{2}$	7×4
10	6— 0	$1\frac{7}{16}$	$1\frac{3}{4}$	10	18	$10\frac{1}{2} \times 6$	$8\frac{1}{2} \times 4\frac{1}{2}$	$7\frac{1}{2} \times 4$
$10\frac{1}{2}$	6— 4	$1\frac{1}{2}$	$1\frac{7}{8}$	$10\frac{1}{2}$	19	$11 \times 6\frac{1}{4}$	$9 \times 4\frac{3}{4}$	8×4
11	6— 8	$1\frac{9}{16}$	$1\frac{15}{16}$	11	$19\frac{3}{4}$	$11\frac{1}{2} \times 6\frac{3}{4}$	$9\frac{1}{2} \times 5$	$8\frac{1}{4} \times 4\frac{1}{2}$
$11\frac{1}{2}$	7— 4	$1\frac{5}{8}$	2	$11\frac{1}{2}$	$20\frac{3}{4}$	12×7	$10 \times 5\frac{1}{4}$	$8\frac{1}{2} \times 5$
12	8— 0	$1\frac{5}{8}$	2	12	$21\frac{1}{2}$	$12\frac{1}{2} \times 7\frac{1}{2}$	$10\frac{1}{2} \times 5\frac{1}{2}$	9×5
$12\frac{1}{2}$	8— 0			$12\frac{1}{2}$	$22\frac{1}{2}$	$13 \times 7\frac{1}{2}$	$11 \times 5\frac{1}{2}$	$9\frac{1}{2} \times 5$
13	8— 0	$d = .38\sqrt{\frac{D^3}{R}}$		13	$23\frac{1}{2}$	$13\frac{1}{2} \times 7\frac{1}{2}$	$11\frac{1}{4} \times 5\frac{3}{4}$	10×5
$13\frac{1}{2}$	8— 0			$13\frac{1}{2}$	$24\frac{1}{2}$	14×8	$11\frac{1}{2} \times 6$	$10 \times 5\frac{1}{4}$
14	8— 0			14	$25\frac{1}{4}$	$14\frac{1}{2} \times 8$	12×6	$10\frac{1}{2} \times 5\frac{1}{4}$
$14\frac{1}{2}$	8— 0			$14\frac{1}{2}$	$26\frac{1}{4}$	$15 \times 8\frac{1}{2}$	$12\frac{1}{4} \times 6\frac{1}{2}$	$10\frac{1}{2} \times 5\frac{1}{2}$
15	8— 0			15	27	$15\frac{1}{2} \times 8\frac{1}{2}$	$12\frac{3}{4} \times 6\frac{1}{2}$	$11 \times 5\frac{1}{2}$

BOLTS for BOLTED TILLERS and QUADRANTS. TABLE 46

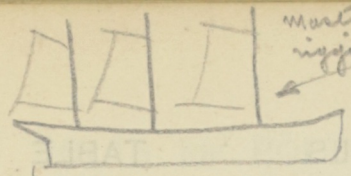
Diameter of Rudder Head as per Table 41.	ONE BOLT EACH SIDE.		TWO BOLTS EACH SIDE.		FOUR BOLTS EACH SIDE.			Thickness of Coupling.
	Diameter.	Distance Centre to Centre.	Diameter.	Distance Centre to Centre.	Diameter.	Inner Bolts Centre to Centre.	Outer Bolts Centre to Centre.	
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
4	$1\frac{3}{4}$	12	$1\frac{3}{8}$	11	$\frac{7}{8}$	$9\frac{1}{2}$	15	$1\frac{1}{2}$
$4\frac{1}{2}$	2	13	$1\frac{1}{2}$	12	1	$10\frac{1}{2}$	$16\frac{1}{2}$	$1\frac{5}{8}$
5	$2\frac{1}{4}$	14	$1\frac{3}{4}$	13	$1\frac{1}{8}$	$11\frac{1}{2}$	18	$1\frac{3}{4}$
$5\frac{1}{2}$	$2\frac{1}{2}$	15	$1\frac{7}{8}$	14	$1\frac{1}{4}$	$12\frac{1}{2}$	20	$1\frac{7}{8}$
6	$2\frac{3}{4}$	$16\frac{1}{2}$	2	15	$1\frac{3}{8}$	$13\frac{1}{2}$	22	2
$6\frac{1}{2}$	3	18	$2\frac{1}{8}$	16	$1\frac{1}{2}$	15	24	2
7	$3\frac{1}{4}$	19	$2\frac{1}{4}$	17	$1\frac{5}{8}$	16	$25\frac{1}{2}$	$2\frac{1}{4}$
$7\frac{1}{2}$	$3\frac{1}{2}$	$20\frac{1}{2}$	$2\frac{1}{2}$	$18\frac{1}{2}$	$1\frac{3}{4}$	17	$27\frac{1}{2}$	$2\frac{1}{4}$
8	$3\frac{3}{4}$	22	$2\frac{5}{8}$	20	$1\frac{7}{8}$	$18\frac{1}{2}$	$29\frac{1}{2}$	$2\frac{1}{2}$
$8\frac{1}{2}$	$3\frac{7}{8}$	23	$2\frac{3}{4}$	21	2	$19\frac{1}{2}$	$31\frac{1}{2}$	$2\frac{1}{2}$
9	4	24	$2\frac{7}{8}$	22	$2\frac{1}{8}$	$20\frac{1}{2}$	$33\frac{1}{2}$	$2\frac{3}{4}$
$9\frac{1}{2}$			3	$23\frac{1}{2}$	$2\frac{1}{8}$	$21\frac{1}{2}$	$34\frac{1}{2}$	$2\frac{3}{4}$
10			$3\frac{1}{4}$	$24\frac{1}{2}$	$2\frac{1}{4}$	$22\frac{1}{2}$	36	3
$10\frac{1}{2}$			$3\frac{3}{8}$	26	$2\frac{3}{8}$	24	38	3
11			$3\frac{5}{8}$	27	$2\frac{1}{2}$	25	40	3
$11\frac{1}{2}$			$3\frac{3}{4}$	$28\frac{1}{2}$	$2\frac{5}{8}$	26	42	3
12			$3\frac{7}{8}$	$29\frac{1}{2}$	$2\frac{3}{4}$	27	$43\frac{1}{2}$	$3\frac{1}{4}$
13			$4\frac{1}{4}$	32	3	$29\frac{1}{2}$	$47\frac{1}{2}$	$3\frac{1}{4}$
14			$4\frac{1}{2}$	$34\frac{1}{2}$	$3\frac{1}{8}$	32	51	$3\frac{1}{4}$
15			$4\frac{7}{8}$	37	$3\frac{3}{8}$	34	54	$3\frac{1}{4}$

MASTS of STEAM VESSELS. TABLE 47

LENGTH OF MAST FROM UPPER DECK TO HOUNDS.	DIAMETER AND THICKNESS OF MAST AT PARTNERS.	DIAMETER AND THICKNESS OF MAST AT HOUNDS.	LENGTH OF MAST FROM UPPER DECK TO HOUNDS.	DIAMETER AND THICKNESS OF MAST AT PARTNERS.	DIAMETER AND THICKNESS OF MAST AT HOUNDS.
Feet.	Inches.	Inches.	Feet.	Inches.	Inches.
30	16 × ·30	13½ × ·26	57	25 × ·38	20½ × ·34
33	17 × ·30	14 × ·26	60	26 × ·40	21 × ·36
36	18 × ·32	14½ × ·28	63	27 × ·42	22 × ·36
39	19 × ·32	15 × ·28	66	28 × ·44	23 × ·38
42	20 × ·34	16 × ·30	69	29 × ·46	24 × ·38
45	21 × ·34	17 × ·30	72	30 × ·48	25 × ·40
48	22 × ·36	18 × ·32	75	31 × ·50	26 × ·40
51	23 × ·36	19 × ·32	78	32 × ·50	27 × ·40
54	24 × ·38	20 × ·34	81	33 × ·50	28 × ·40

STAYS to MASTS of STEAMERS. TABLE 48

LENGTH OF MAST FROM UPPER DECK TO HOUNDS.	SHROUDS TO EACH SIDE OF MAST.		TOP MAST BACK STAY.		FORE TOP MAST STAY.		FORE STAY.
	Number.	Size.	Number.	Size.	Number.	Size.	
Feet.		Inches.		Inches.		Inches.	Inches.
30	2	2½	1	1½	—	—	2¾
33	2	2¾	1	1¾	—	—	3
36	2	3	1	2	—	—	3
39	3	3	1	2¼	1	2¼	3¼
42	3	3¼	1	2½	1	2½	3¼
45	3	3½	1	2¾	1	2¾	3½
48	3	3½	1	3	1	3	3½
51	3	3¾	1	3	1	3	3½
54	3	4	1	3	1	3	4
57	3	4	1	3	1	3	4
60	3	4¼	1	3	1	3	4
63	3	4½	1	3	1	3	4¼
66	3	4¾	1	3	1	3	4¼
69	3	5	2	3	2	3	4¼
72	3	5	2	3	2	3	4½
75	4	4½	2	3	2	3	4½
78	4	4¾	2	3	2	3	4½
81	4	5	2	3	2	3	4½



MASTS of SAILING VESSELS. TABLE 49

LENGTH OF MAST.		DIAMETER AND THICKNESS OF MAST.								SIZES OF ANGLE BARS IN MASTS.	CHEEKS.	
Fore and aft Rig.	Square Rig.	Partners.		Heel.		Hounds.		Head.			Thickness of Plate.	Sizes of Angle Bars.
Feet.	Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
36	30	16	·30	13	·26	13½	·26	11	·24		·40	3½ × 2½ × ·34
37	31	17	·30	13½	·26	14	·26	11½	·24		·40	3½ × 3 × ·36
38	32	18	·30	14	·26	15	·26	12	·26		·40	3½ × 3 × ·36
39	33	19	·34	15	·30	15½	·30	12½	·26		·44	4 × 3 × ·40
41	34	20	·34	16	·30	16½	·30	13½	·30		·44	4 × 3 × ·40
43	35	21	·34	16½	·30	17½	·30	14	·30		·44	4 × 3 × ·40
45	36	22	·36	17	·30	18½	·30	14½	·30		·46	4½ × 3 × ·40
47	37	23	·36	18	·30	19	·30	15½	·30		·46	4½ × 3 × ·44
49	38	24	·36	19	·30	20	·30	16	·30		·46	4½ × 3 × ·44
51	39	25	·40	19½	·34	21	·34	16½	·34		·50	5 × 3 × ·46
53	40	26	·40	20	·34	21½	·34	17½	·34		·50	5 × 3 × ·50
55	42	27	·44	21	·34	22½	·34	18	·34		·50	5 × 3½ × ·50
57	44	28	·44	22	·36	23	·36	18½	·36	3½ × 3 × ·40	·54	5 × 3½ × ·50
59	46	29	·46	22½	·36	24	·36	19½	·36	4 × 3 × ·40	·54	5½ × 4 × ·54
62	48	30	·46	23	·40	25	·40	20	·36	4 × 3 × ·44	·56	6 × 4 × ·54
65	50	31	·50	24	·40	26	·40	20½	·36	4½ × 3 × ·44	·60	6 × 4 × ·56
68	52	32	·50	25	·40	26½	·40	21	·36	5 × 3 × ·46	·60	6 × 4 × ·56
71	54	33	·50	26	·40	27	·40	21½	·36	5 × 3 × ·48	·60	6 × 4 × ·56

STEEL BOWSPRITS.

LENGTH OUTSIDE BED.	BED.		HEEL.		CAP.		SIZES OF ANGLE BARS.	LENGTH OUTSIDE BED.	BED.		HEEL.		CAP.		SIZES OF ANGLE BARS.
	Diameter.	Thickness.	Diameter	Thickness.	Diameter.	Thickness.			Diameter.	Thickness	Diameter	Thickness.	Diameter.	Thickness.	
Feet.	Inches.	Inches.	Inches.	Inches.	Inches	Inches.	Inches.	Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
14	16½	·30	14	·30	12		2½ × 2 × ·30	21	25½	·40	21	·36	17½	·32	3½ × 3 × ·36
15	17½	·30	15	·30	12½	·30	2½ × 2 × ·30	22	26½	·40	22	·36	18½	·32	4 × 3 × ·40
16	19	·30	16	·30	13	·30	3 × 2 × ·30	23	28	·44	23	·40	19	·34	4 × 3½ × ·40
17	20	·34	17	·34	14	·30	3 × 2 × ·30	24	29	·44	24	·40	20	·34	4 × 3½ × ·40
18	21½	·36	18	·34	15	·30	3 × 2½ × ·30	25	30	·46	25	·40	21	·36	4½ × 3½ × ·42
19	23	·36	19	·34	16	·30	3 × 3 × ·32	26	31½	·46	26	·40	21½	·36	4½ × 3½ × ·44
20	24½	·40	20	·36	16½	·32	3½ × 3 × ·34	27	33	·46	27	·40	22	·36	4½ × 3½ × ·46

YARDS and TOPMASTS of SAILING VESSELS. TABLE 50

YARDS.											TOPMASTS.						
Length Cleated.	Centre.		First Quarter.		Second Quarter.		Third Quarter.		Ends at Cleats.		Length.	Heel.		Lower part of Head.		Head.	
	Dia.	Thickness.	Dia.	Thickness.	Dia.	Thickness.	Dia.	Thickness.	Dia.	Thickness.		Dia.	Thickness.	Dia.	Thickness.	Dia.	Thickness.
Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
32	8	·18	$7\frac{7}{8}$	·18	$7\frac{1}{4}$	·18	6	·18	4	·12	12	12	·24	$10\frac{1}{2}$	·24	9	·18
36	9	·18	$8\frac{3}{4}$	·18	$8\frac{1}{8}$	·18	$6\frac{3}{4}$	·18	$4\frac{1}{2}$	·12	$13\frac{1}{2}$	$12\frac{1}{2}$	·24	11	·24	$9\frac{1}{2}$	·18
40	10	·20	$9\frac{3}{4}$	·20	9	·18	$7\frac{1}{2}$	·18	5	·12	15	13	·24	$11\frac{1}{2}$	·24	10	·18
44	11	·22	$10\frac{3}{4}$	·22	10	·18	$8\frac{1}{4}$	·18	$5\frac{1}{2}$	·12	$16\frac{1}{2}$	14	·26	$12\frac{1}{2}$	·24	$10\frac{1}{2}$	·20
48	12	·24	$11\frac{3}{4}$	·24	$10\frac{3}{4}$	·20	9	·18	6	·14	18	$14\frac{1}{2}$	·26	13	·24	11	·22
52	13	·24	$12\frac{5}{8}$	·24	$11\frac{3}{4}$	·22	$9\frac{3}{4}$	·18	$6\frac{1}{2}$	·14	$19\frac{1}{2}$	15	·30	$13\frac{1}{2}$	·26	$11\frac{1}{2}$	·24
56	14	·26	$13\frac{5}{8}$	·26	$12\frac{5}{8}$	·24	$10\frac{1}{2}$	·20	7	·16	21	16	·30	14	·26	12	·24
60	15	·26	$14\frac{5}{8}$	·26	$13\frac{1}{2}$	·26	$11\frac{1}{4}$	·22	$7\frac{1}{2}$	·16	$22\frac{1}{2}$	$16\frac{1}{2}$	·30	$14\frac{1}{2}$	·26	$12\frac{1}{2}$	·26
64	16	·30	$15\frac{5}{8}$	·30	$14\frac{3}{8}$	·30	12	·24	8	·18	24	17	·34	15	·30	13	·30
68	17	·30	$16\frac{1}{2}$	·30	$15\frac{1}{4}$	·30	$12\frac{3}{4}$	·24	$8\frac{1}{2}$	·18	$25\frac{1}{2}$	18	·34	16	·30	$13\frac{1}{2}$	·30
72	18	·30	$17\frac{1}{2}$	·30	$16\frac{1}{4}$	·30	$13\frac{1}{2}$	·26	9	·18	27	$18\frac{1}{2}$	·34	$16\frac{1}{2}$	·30	14	·30
76	19	·32	$18\frac{1}{2}$	·30	$17\frac{1}{8}$	·30	$14\frac{1}{4}$	·26	$9\frac{1}{2}$	·20	$28\frac{1}{2}$	19	·34	17	·30	$14\frac{1}{2}$	·30
80	20	·36	$19\frac{1}{2}$	·30	18	·30	15	·26	10	·22	30	20	·34	18	·30	15	·30
84	21	·40	$20\frac{1}{2}$	·34	19	·30	$15\frac{3}{4}$	·30	$10\frac{1}{2}$	·24	$31\frac{1}{2}$	$20\frac{1}{2}$	·34	$18\frac{1}{2}$	·30	$15\frac{1}{2}$	·30
88	22	·40	$21\frac{1}{2}$	·34	$19\frac{3}{4}$	·30	$16\frac{1}{2}$	·30	11	·24	33	21	·36	19	·30	16	·30
92	23	·40	$22\frac{1}{2}$	·36	$20\frac{3}{4}$	·34	$17\frac{1}{4}$	·30	$11\frac{1}{2}$	·26	35	22	·36	20	·30	$16\frac{1}{2}$	·30
96	24	·40	$23\frac{3}{8}$	·36	$21\frac{5}{8}$	·34	18	·30	12	·26	37	23	·36	21	·30	17	·30

STANDING RIGGING of SAILING VESSELS.

TABLE 51

(See Continuation.)

SECOND LONGITUDINAL NUMERAL L × (B + D).	6200	7100	8000	9000	10000	11400	12800	14200
	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.
FORE and MAIN Shrouds	4 of $2\frac{1}{2}$	4 of $2\frac{3}{4}$	5 of 3	5 of $3\frac{1}{4}$ and cap	5 of $3\frac{1}{2}$ and cap	5 of $3\frac{3}{4}$ and cap	6 of 4 and cap	6 of $4\frac{1}{8}$ and cap
„ „ Chain plates	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{3}{4}$	$1\frac{7}{8}$	$1\frac{7}{8}$
„ „ Dead-eyes	$7\times4\frac{1}{2}$	$7\frac{1}{2}\times4\frac{1}{2}$	8×5	$8\frac{1}{2}\times5$	$9\times5\frac{1}{2}$	$9\frac{1}{2}\times5\frac{1}{2}$	10×6	$10\frac{1}{2}\times6$
„ „ Lanyards (hemp)	$3\frac{1}{2}$	$3\frac{3}{4}$	4	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	5	$5\frac{1}{4}$
„ „ Rigging screws, diameter at bottom of thread	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{5}{8}$
„ „ Rigging screws, diameter of pins	1	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$
„ „ Topmast backstays	2 of $2\frac{1}{2}$	2 of $2\frac{3}{4}$	2 of 3	2 of $3\frac{1}{4}$	2 of $3\frac{1}{2}$	2 of $3\frac{3}{4}$	3 of 4	3 of $4\frac{1}{8}$
„ „ Top-gallant backstays	$1\frac{3}{4}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{8}$	2 „ $2\frac{1}{2}$	2 „ $2\frac{5}{8}$	2 „ $2\frac{3}{4}$
„ „ Lower stays	2 of $2\frac{1}{2}$	2 of $2\frac{3}{4}$	2 of 3	2 of $3\frac{1}{4}$	2 of $3\frac{1}{2}$	2 „ $3\frac{3}{4}$	2 „ 4	2 „ $4\frac{1}{8}$
„ „ Topmast stays	$2\frac{1}{2}$	$2\frac{3}{4}$	3	$3\frac{1}{4}$	2 „ $3\frac{1}{2}$	2 „ $3\frac{3}{4}$	2 „ 4	2 „ $4\frac{1}{8}$
„ „ Top-gallant stays	$1\frac{3}{4}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$
MIZZEN Shrouds	3 of $2\frac{1}{4}$	3 of $2\frac{3}{8}$	4 of $2\frac{1}{2}$	4 of $2\frac{5}{8}$	5 of $2\frac{3}{4}$	5 of $2\frac{7}{8}$	5 of 3	5 of $3\frac{1}{4}$ and cap
„ Topmast backstays	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	2 „ $2\frac{5}{8}$	2 „ $2\frac{3}{4}$	2 „ $2\frac{7}{8}$	3 „ 3	3 „ $3\frac{1}{4}$
„ Top-gallant backstays	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	2 „ 2	2 „ $2\frac{1}{8}$
„ Lower stays	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{7}{8}$	2 „ 3	2 „ $3\frac{1}{4}$
„ Topmast stays	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{7}{8}$	3	2 „ $3\frac{1}{4}$
„ Top-gallant stays	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$
BOBSTAY Bar	2	2	2	2	$2\frac{1}{4}$	$2\frac{1}{2}$	3	$3\frac{1}{4}$
„ Pin	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{7}{8}$	$2\frac{1}{8}$	$2\frac{1}{4}$
„ Chain	$1\frac{3}{16}$	$1\frac{4}{16}$	$1\frac{4}{16}$	$1\frac{4}{16}$	$1\frac{5}{16}$	$1\frac{6}{16}$	$1\frac{8}{16}$	$1\frac{10}{16}$
BOWSPRIT Shrouds (chain)	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{10}{16}$	$\frac{11}{16}$	$\frac{12}{16}$	2 of $\frac{12}{16}$	2 of $\frac{13}{16}$	2 of $\frac{14}{16}$

STANDING RIGGING of SAILING VESSELS.

TABLE 51
(Concluded.)

SECOND LONGITUDINAL NUMERAL L × (B + D).	15600	17000	18400	20000	21900	24200	27200
	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.	No. Size. Inches.
FORE and MAIN Shrouds	6 of $4\frac{1}{4}$ and cap	6 of $4\frac{1}{2}$ and cap	6 of $4\frac{3}{4}$ and cap	6 of $4\frac{7}{8}$ and cap	6 of 5 and cap	6 of $5\frac{1}{4}$ and cap	6 of $5\frac{1}{2}$ and cap
„ „ Chain plates...	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$
„ „ Dead-eyes	11 × 6	$11\frac{1}{2} \times 6\frac{1}{2}$	12 × 7	—	—	—	—
„ „ Lanyards (hemp)	$5\frac{1}{2}$	$5\frac{3}{4}$	6	—	—	—	—
„ „ Rigging screws, diameter at bottom of thread	$1\frac{3}{4}$	$1\frac{3}{4}$	$1\frac{7}{8}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$
„ „ Rigging screws, diameter of pins	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	2
„ „ Topmast backstays	3 of $4\frac{1}{4}$	3 of $4\frac{1}{2}$	3 of $4\frac{3}{4}$	3 of $4\frac{7}{8}$	3 of 5	3 of $5\frac{1}{4}$	3 of $5\frac{1}{2}$
„ „ Top-gallant backstays	2 „ 3	2 „ $3\frac{1}{4}$	2 „ $3\frac{1}{2}$	2 „ $3\frac{3}{4}$	2 „ $3\frac{7}{8}$	2 „ $4\frac{1}{8}$	2 „ $4\frac{1}{4}$
„ „ Lower stays...	2 „ $4\frac{1}{4}$	2 „ $4\frac{1}{2}$	2 „ $4\frac{3}{4}$	2 „ $4\frac{7}{8}$	2 „ 5	2 „ $5\frac{1}{4}$	2 „ $5\frac{1}{2}$
„ „ Topmast stays	2 „ $4\frac{1}{4}$	2 „ $4\frac{1}{2}$	2 „ $4\frac{3}{4}$	2 „ $4\frac{7}{8}$	2 „ 5	2 „ $5\frac{1}{4}$	2 „ $5\frac{1}{2}$
„ „ Top-gallant stays	3	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{3}{4}$	$3\frac{7}{8}$	$4\frac{1}{8}$	$4\frac{1}{4}$
MIZZEN Shrouds	5 of $3\frac{1}{2}$ and cap	5 of $3\frac{3}{4}$ and cap	5 of 4 and cap	5 of $4\frac{1}{8}$ and cap	5 of $4\frac{1}{4}$ and cap	5 of $4\frac{3}{8}$ and cap	5 of $4\frac{1}{2}$ and cap
„ Topmast backstays	3 „ $3\frac{1}{2}$	3 „ $3\frac{3}{4}$	3 „ 4	3 „ $4\frac{1}{8}$	3 „ $4\frac{1}{4}$	3 „ $4\frac{3}{8}$	3 „ $4\frac{1}{2}$
„ Top-gallant backstays	2 „ $2\frac{1}{4}$	2 „ $2\frac{1}{2}$	2 „ $2\frac{3}{4}$	2 „ $2\frac{7}{8}$	2 „ 3	2 „ $3\frac{1}{8}$	2 „ $3\frac{1}{4}$
„ Lower stays	2 „ $3\frac{1}{2}$	2 „ $3\frac{3}{4}$	2 „ 4	2 „ $4\frac{1}{8}$	2 „ $4\frac{1}{4}$	2 „ $4\frac{3}{8}$	2 „ $4\frac{1}{2}$
„ Topmast stays	2 „ $3\frac{1}{2}$	2 „ $3\frac{3}{4}$	2 „ 4	2 „ $4\frac{1}{8}$	2 „ $4\frac{1}{4}$	2 „ $4\frac{3}{8}$	2 „ $4\frac{1}{2}$
„ Top-gallant stays	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{7}{8}$	3	$3\frac{1}{8}$	$3\frac{1}{4}$
BOBSTAY Bar	$3\frac{1}{2}$	$3\frac{3}{4}$	$3\frac{3}{4}$	$3\frac{7}{8}$	4	$4\frac{1}{8}$	$4\frac{1}{8}$
„ Pin	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{7}{8}$	3	$3\frac{1}{8}$	$3\frac{1}{8}$
„ Chain	$1\frac{1}{16}^{2}$	$1\frac{1}{16}^{3}$	$1\frac{1}{16}^{4}$	$1\frac{1}{16}^{5}$	2	$2\frac{1}{16}$	$2\frac{1}{16}$
BOWSPRIT Shrouds (chain)	2 of $\frac{14}{16}$	2 of 1	2 of 1	2 of $1\frac{1}{16}$	2 of $1\frac{1}{16}$	2 of $1\frac{2}{16}$	2 of $1\frac{2}{16}$

ANCHOR CRANES. TABLE 52

WEIGHT OF ANCHOR INCLUDING STOCK.	OUTREACH OF CRANE.							
	Feet. 9	Feet. 10	Feet. 11	Feet. 12	Feet. 13	Feet. 14	Feet. 15	Feet. 16
	DIAMETER OF MAIN POST AT DECK.							
Cwts. 20	Inches. 6	Inches. $6\frac{1}{4}$	Inches. $6\frac{1}{2}$	Inches. $6\frac{3}{4}$	Inches. $6\frac{3}{4}$	Inches. 7	Inches. $7\frac{1}{4}$	Inches. $7\frac{1}{2}$
25	$6\frac{1}{2}$	$6\frac{3}{4}$	7	$7\frac{1}{4}$	$7\frac{1}{4}$	$7\frac{1}{2}$	$7\frac{3}{4}$	8
30	7	$7\frac{1}{4}$	$7\frac{1}{2}$	$7\frac{3}{4}$	$7\frac{3}{4}$	8	$8\frac{1}{4}$	$8\frac{1}{2}$
35	$7\frac{1}{4}$	$7\frac{1}{2}$	$7\frac{3}{4}$	8	8	$8\frac{1}{4}$	$8\frac{1}{2}$	$8\frac{3}{4}$
40	$7\frac{1}{2}$	$7\frac{3}{4}$	8	$8\frac{1}{4}$	$8\frac{1}{2}$	$8\frac{3}{4}$	9	$9\frac{1}{4}$
45	8	$8\frac{1}{4}$	$8\frac{1}{2}$	$8\frac{3}{4}$	9	$9\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{3}{4}$
50	$8\frac{1}{4}$	$8\frac{1}{2}$	$8\frac{3}{4}$	9	$9\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{3}{4}$	10
55	$8\frac{1}{2}$	$8\frac{3}{4}$	9	$9\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{3}{4}$	10	$10\frac{1}{4}$
60	$8\frac{3}{4}$	9	$9\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{3}{4}$	10	$10\frac{1}{4}$	$10\frac{1}{2}$

CORRESPONDING DIMENSIONS OF MAIN POST, TIE RODS AND JIBS.

	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Diameter of Main Post at Deck ...	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$	8	$8\frac{1}{2}$	9	$9\frac{1}{2}$	10	$10\frac{1}{2}$	11
Tie Rod	$1\frac{3}{4}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{7}{8}$	3
Jib (Diameter at Middle)	3	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{3}{4}$	4	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	5	$5\frac{1}{4}$	$5\frac{1}{2}$

Where two tie rods are fitted the diameter of each is to be three-quarters that of the single rod required.

TABLE OF EQUIVALENT SIZES.

DIAMETER IN INCHES AT DECK OF SOLID WROUGHT IRON DAVITS OR OF MAIN POSTS OF ANCHOR CRANES.	Ins. 3	Ins. $3\frac{1}{4}$	Ins. $3\frac{1}{2}$	Ins. $3\frac{3}{4}$	Ins. 4	Ins. $4\frac{1}{4}$	Ins. $4\frac{1}{2}$	Ins. $4\frac{3}{4}$	Ins. 5	Ins. $5\frac{1}{4}$	Ins. $5\frac{1}{2}$	Ins. $5\frac{3}{4}$	Ins. 6	Ins. $6\frac{1}{4}$	Ins. $6\frac{1}{2}$	Ins. $6\frac{3}{4}$	Ins. 7	Ins. $7\frac{1}{4}$	Ins. $7\frac{1}{2}$	Ins. $7\frac{3}{4}$	Ins. 8	Ins. $8\frac{1}{4}$	Ins. $8\frac{1}{2}$
DIAMETER AND THICKNESS IN INCHES OF APPROVED WELDLESS DRAWN STEEL HOLLOW BOAT OR ANCHOR DAVITS.	4 × $\frac{4}{16}$	$4\frac{1}{2}$ × $\frac{4}{16}$	$4\frac{3}{4}$ × $\frac{4}{16}$	$5\frac{1}{4}$ × $\frac{4}{16}$	$5\frac{1}{4}$ × $\frac{5}{16}$	$5\frac{3}{4}$ × $\frac{5}{16}$	6 × $\frac{5}{16}$	$6\frac{1}{2}$ × $\frac{5}{16}$	$6\frac{1}{2}$ × $\frac{6}{16}$	7 × $\frac{6}{16}$	$7\frac{1}{4}$ × $\frac{6}{16}$	$7\frac{3}{4}$ × $\frac{6}{16}$	$7\frac{3}{4}$ × $\frac{7}{16}$	$8\frac{1}{4}$ × $\frac{7}{16}$	$8\frac{1}{2}$ × $\frac{7}{16}$	9 × $\frac{7}{16}$	9 × $\frac{8}{16}$	$9\frac{1}{2}$ × $\frac{8}{16}$	$9\frac{3}{4}$ × $\frac{8}{16}$	$10\frac{1}{4}$ × $\frac{8}{16}$	$10\frac{1}{4}$ × $\frac{9}{16}$	$10\frac{3}{4}$ × $\frac{9}{16}$	11 × $\frac{9}{16}$

ANCHORS and CHAINS for STEAM VESSELS.

TABLE 53

(See Continuation.)

* EQUIPMENT NUMBER.	Letters for Equipment as inserted in Register Book, Column 7.	ANCHORS. Number.		Bower Anchors. Ex Stock.			Bower Anchors. Stockless.			Stream Anchors. Ex Stock.		CHAIN CABLES. Stud Chain Cables.				
		Bowers.	Stream.	Weight.	Test.	Collective Weight.	Weight.	Test.	Collective Weight.	Stream.	Test.	Length.	Minimum Size.	Proved to Statutory Test.	Breaking Test.	Minimum Weight.
				Cwts.	Tons.	Cwts.	Cwts.	Tons.	Cwts.	Cwts.	Tons.	Fms.	Inches.	Tons.	Tons.	Cwts.
3000	*a*	2	1	$3\frac{1}{2}$	$5\frac{18}{20}$	7	$4\frac{1}{2}$	$6\frac{17}{20}$	$8\frac{3}{4}$	$\frac{3}{4}$	—	120	$\frac{11}{16}$	$8\frac{5}{10}$	$12\frac{3}{4}$	29
3600	*b*	2	1	$4\frac{1}{4}$	$6\frac{12}{20}$	$8\frac{1}{2}$	$5\frac{1}{4}$	$7\frac{11}{20}$	$10\frac{1}{2}$	$1\frac{1}{4}$	$3\frac{13}{20}$	120	$\frac{12}{16}$	$10\frac{1}{8}$	$15\frac{1}{8}$	$34\frac{1}{2}$
4200	*c*	2	1	5	$7\frac{7}{20}$	10	$6\frac{1}{4}$	$8\frac{10}{20}$	$12\frac{1}{2}$	$1\frac{3}{4}$	$4\frac{4}{20}$	135	$\frac{13}{16}$	$11\frac{7}{8}$	$17\frac{8}{10}$	46
4800	*d*	2	1	$5\frac{3}{4}$	8	$11\frac{1}{2}$	$7\frac{1}{4}$	$9\frac{9}{20}$	$14\frac{1}{4}$	$2\frac{1}{4}$	$4\frac{15}{20}$	165	$\frac{14}{16}$	$13\frac{3}{4}$	$20\frac{5}{8}$	$64\frac{1}{4}$
5400	*e*	2	1	$6\frac{1}{2}$	$8\frac{15}{20}$	13	$8\frac{1}{4}$	$10\frac{7}{20}$	$16\frac{1}{4}$	$2\frac{3}{4}$	$5\frac{5}{20}$	165	$\frac{15}{16}$	$15\frac{8}{10}$	$23\frac{7}{10}$	$74\frac{1}{2}$
6000	*f*	2	1	$7\frac{1}{4}$	$9\frac{9}{20}$	$14\frac{1}{2}$	9	$11\frac{2}{20}$	18	3	$5\frac{10}{20}$	165	1	18	27	84
6700	*g*	3	1	$8\frac{1}{4}$	$10\frac{7}{20}$	$23\frac{1}{2}$	$10\frac{1}{4}$	$12\frac{4}{20}$	$29\frac{1}{4}$	$3\frac{1}{2}$	$5\frac{18}{20}$	165	$1\frac{1}{16}$	$20\frac{3}{10}$	$30\frac{4}{10}$	$95\frac{1}{4}$
7400	*h*	3	1	10	12	$28\frac{1}{2}$	$12\frac{1}{2}$	$14\frac{6}{20}$	$35\frac{1}{2}$	4	$6\frac{7}{20}$	195	$1\frac{2}{16}$	$22\frac{3}{4}$	$34\frac{1}{8}$	$126\frac{1}{4}$
8100	*i*	3	1	$11\frac{3}{4}$	$13\frac{12}{20}$	$33\frac{1}{2}$	$14\frac{1}{2}$	$16\frac{1}{20}$	$41\frac{3}{4}$	$4\frac{1}{4}$	$6\frac{12}{20}$	195	$1\frac{3}{16}$	$25\frac{3}{8}$	38	$141\frac{1}{4}$
8900	*j*	3	1	$13\frac{1}{2}$	$15\frac{3}{20}$	$38\frac{1}{2}$	$16\frac{3}{4}$	18	48	$4\frac{3}{4}$	$7\frac{2}{20}$	210	$1\frac{4}{16}$	$28\frac{1}{8}$	$42\frac{1}{8}$	168
9700	*k*	3	1	$15\frac{1}{4}$	$16\frac{14}{20}$	$43\frac{1}{2}$	19	$19\frac{17}{20}$	$54\frac{1}{4}$	$5\frac{1}{4}$	$7\frac{11}{20}$	210	$1\frac{5}{16}$	31	$46\frac{1}{2}$	$185\frac{1}{2}$
10600	*l*	3	1	17	$18\frac{5}{20}$	$48\frac{1}{2}$	$21\frac{1}{4}$	$21\frac{16}{20}$	$60\frac{1}{2}$	$5\frac{3}{4}$	8	210	$1\frac{6}{16}$	34	51	203
11600	*m*	3	1	$18\frac{3}{4}$	$19\frac{13}{20}$	$53\frac{1}{2}$	$23\frac{1}{4}$	$23\frac{6}{20}$	$66\frac{3}{4}$	6	$8\frac{5}{20}$	210	$1\frac{7}{16}$	$37\frac{1}{8}$	$55\frac{5}{8}$	$222\frac{1}{2}$
12700	*n*	3	1	$20\frac{1}{2}$	$21\frac{3}{20}$	$58\frac{1}{2}$	$25\frac{1}{2}$	$25\frac{3}{20}$	73	$6\frac{1}{2}$	$8\frac{15}{20}$	210	$1\frac{8}{16}$	$40\frac{5}{10}$	$58\frac{7}{10}$	242
13900	*o*	3	1	$22\frac{1}{2}$	$22\frac{15}{20}$	64	28	$27\frac{2}{20}$	80	7	$9\frac{5}{20}$	240	$1\frac{9}{16}$	$43\frac{9}{10}$	$61\frac{4}{10}$	$298\frac{3}{4}$
15200	*p*	3	1	$24\frac{1}{2}$	$24\frac{6}{20}$	$69\frac{1}{2}$	$30\frac{1}{2}$	29	87	$7\frac{3}{4}$	$9\frac{18}{20}$	240	$1\frac{10}{16}$	$47\frac{5}{10}$	$66\frac{5}{10}$	$319\frac{1}{2}$
16700	*q*	3	1	$26\frac{1}{2}$	26	75	33	$30\frac{17}{20}$	94	$8\frac{1}{2}$	$10\frac{12}{20}$	240	$1\frac{11}{16}$	$51\frac{1}{4}$	$71\frac{3}{4}$	$344\frac{3}{4}$
18500	*r*	3	1	$28\frac{1}{2}$	$27\frac{10}{20}$	81	$35\frac{1}{2}$	$32\frac{15}{20}$	101	$9\frac{1}{4}$	$11\frac{6}{20}$	240	$1\frac{12}{16}$	$55\frac{1}{8}$	$77\frac{1}{8}$	$370\frac{1}{2}$
20600	*s*	3	1	31	$29\frac{7}{20}$	88	$38\frac{3}{4}$	$34\frac{19}{20}$	110	10	12	240	$1\frac{13}{16}$	$59\frac{1}{8}$	$82\frac{3}{4}$	$397\frac{3}{4}$
22700	*t*	3	1	$33\frac{1}{2}$	$31\frac{5}{20}$	$95\frac{1}{2}$	42	$37\frac{2}{20}$	$119\frac{1}{2}$	11	$12\frac{17}{20}$	240	$1\frac{14}{16}$	$63\frac{1}{4}$	$88\frac{5}{10}$	$425\frac{1}{4}$
25000	*u*	3	1	36	$33\frac{2}{20}$	103	45	$39\frac{5}{20}$	128	12	$13\frac{17}{20}$	270	$1\frac{15}{16}$	$67\frac{5}{10}$	$94\frac{5}{10}$	$511\frac{1}{2}$
27300	*v*	3	1	39	$35\frac{2}{20}$	111	$48\frac{3}{4}$	$41\frac{11}{20}$	139	13	$14\frac{15}{20}$	270	2	72	$100\frac{8}{10}$	$538\frac{3}{4}$
29700	*w*	3	1	42	$37\frac{2}{20}$	$119\frac{1}{2}$	$52\frac{1}{2}$	$43\frac{18}{20}$	$149\frac{1}{2}$	14	$15\frac{12}{20}$	270	$2\frac{1}{16}$	$76\frac{5}{10}$	$107\frac{1}{10}$	$573\frac{3}{4}$
32200	*x*	3	1	45	$39\frac{5}{20}$	128	$56\frac{1}{4}$	$46\frac{3}{20}$	160	15	$16\frac{10}{20}$	270	$2\frac{2}{16}$	$81\frac{1}{4}$	$113\frac{3}{4}$	$608\frac{3}{4}$
34800	*y*	3	1	48	$41\frac{2}{20}$	$136\frac{1}{2}$	60	$48\frac{7}{20}$	$170\frac{1}{2}$	$16\frac{1}{4}$	$17\frac{11}{20}$	270	$2\frac{3}{16}$	$86\frac{1}{8}$	$120\frac{5}{10}$	$645\frac{3}{4}$
37600	*z*	3	1	51	43	$145\frac{1}{2}$	$63\frac{3}{4}$	$50\frac{7}{20}$	182	$17\frac{1}{2}$	$18\frac{12}{20}$	270	$2\frac{4}{16}$	$91\frac{1}{8}$	$127\frac{5}{10}$	$682\frac{1}{4}$
40400	*a*†	3	1	$54\frac{1}{2}$	$45\frac{1}{20}$	$155\frac{1}{2}$	68	$52\frac{12}{20}$	$194\frac{1}{2}$	19	$19\frac{17}{20}$	270	$2\frac{5}{16}$	$96\frac{1}{4}$	$134\frac{3}{4}$	$720\frac{3}{4}$
43200	*b*†	3	1	58	$47\frac{5}{20}$	$165\frac{1}{2}$	$72\frac{1}{2}$	55	207	$20\frac{1}{2}$	$21\frac{3}{20}$	300	$2\frac{6}{16}$	$101\frac{5}{10}$	$142\frac{1}{10}$	$844\frac{1}{4}$
46000	*c*†	3	1	$61\frac{1}{2}$	$49\frac{3}{20}$	$175\frac{1}{2}$	77	$57\frac{5}{20}$	$219\frac{1}{2}$	22	$22\frac{7}{20}$	300	$2\frac{7}{16}$	$106\frac{9}{10}$	$149\frac{5}{8}$	$890\frac{1}{4}$
48800	*d*†	3	1	65	51	$185\frac{1}{2}$	$81\frac{1}{4}$	$59\frac{2}{20}$	232	$23\frac{1}{2}$	$23\frac{10}{20}$	300	$2\frac{8}{16}$	$112\frac{5}{10}$	$157\frac{5}{10}$	940
51600	*e*†	3	1	$68\frac{1}{2}$	$52\frac{18}{20}$	$195\frac{1}{2}$	$85\frac{1}{2}$	$61\frac{5}{20}$	$244\frac{1}{2}$	25	$24\frac{15}{20}$	300	$2\frac{9}{16}$	$116\frac{7}{10}$	$163\frac{3}{8}$	989
54600	*f*†	3	1	72	$54\frac{15}{20}$	206	90	$63\frac{5}{20}$	$257\frac{1}{2}$	$26\frac{1}{2}$	26	300	$2\frac{10}{16}$	$120\frac{9}{10}$	$169\frac{1}{4}$	1040
57600	*g*†	3	1	76	$56\frac{15}{20}$	217	95	$65\frac{7}{20}$	271	28	$27\frac{2}{20}$	330	$2\frac{11}{16}$	$125\frac{1}{10}$	$175\frac{1}{8}$	1200
60600	*h*†	3	1	80	$58\frac{10}{20}$	228	100	$67\frac{5}{20}$	285	$29\frac{1}{2}$	$28\frac{5}{20}$	330	$2\frac{12}{16}$	$129\frac{3}{10}$	181	1258
63800	*i*†	3	1	$83\frac{1}{2}$	$60\frac{5}{20}$	238	$104\frac{1}{2}$	$68\frac{19}{20}$	298	31	$29\frac{7}{20}$	330	$2\frac{13}{16}$	$133\frac{4}{10}$	$186\frac{3}{4}$	1317
67000	*j*†	3	1	87	$61\frac{17}{20}$	248	109	$70\frac{12}{20}$	311	$32\frac{1}{2}$	$30\frac{10}{20}$	330	$2\frac{14}{16}$	$137\frac{6}{10}$	$192\frac{5}{8}$	1378
70200	*k*†	3	1	91	$63\frac{12}{20}$	259	$113\frac{1}{2}$	$72\frac{6}{20}$	324	34	$31\frac{12}{20}$	330	$2\frac{15}{16}$	$141\frac{7}{10}$	$198\frac{3}{8}$	1440
73400	*l*†	3	1	$94\frac{1}{2}$	$65\frac{3}{20}$	269	118	74	336	$35\frac{1}{2}$	$32\frac{15}{20}$	330	3	$145\frac{8}{10}$	$204\frac{1}{10}$	1503
76800	*m*†	3	1	98	$66\frac{10}{20}$	279	$122\frac{1}{2}$	$75\frac{10}{20}$	349	$37\frac{1}{4}$	$33\frac{18}{20}$	330	$3\frac{1}{16}$	$149\frac{8}{10}$	$209\frac{7}{10}$	1568
80200	*n*†	3	1	$101\frac{1}{2}$	$67\frac{16}{20}$	290	127	$76\frac{18}{20}$	362	39	$35\frac{2}{20}$	330	$3\frac{2}{16}$	$153\frac{3}{4}$	$215\frac{1}{4}$	1634
83800	*o*†	3	1	$105\frac{1}{2}$	$69\frac{6}{20}$	301	132	$78\frac{10}{20}$	376	$40\frac{3}{4}$	$36\frac{6}{20}$	330	$3\frac{3}{16}$	$157\frac{7}{10}$	$220\frac{3}{4}$	1701
87600	*p*†	3	1	$109\frac{1}{2}$	$70\frac{16}{20}$	312	137	$80\frac{1}{20}$	390	$42\frac{1}{2}$	$37\frac{10}{20}$	330	$3\frac{4}{16}$	$161\frac{6}{10}$	$226\frac{2}{10}$	1769
91600	*q*†	3	1	$113\frac{1}{2}$	$72\frac{6}{20}$	324	142	$81\frac{12}{20}$	404	$44\frac{1}{4}$	$38\frac{15}{20}$	330	$3\frac{5}{16}$	$165\frac{4}{10}$	$231\frac{5}{10}$	1839
95800	*r*†	3	1	118	74	336	$147\frac{1}{2}$	$83\frac{6}{20}$	420	46	$39\frac{17}{20}$	330	$3\frac{6}{16}$	$169\frac{1}{8}$	$236\frac{3}{4}$	1910
100200	*s*†	3	1	$122\frac{1}{2}$	$75\frac{10}{20}$	349	153	85	436	$47\frac{3}{4}$	$40\frac{19}{20}$	330	$3\frac{7}{16}$	$172\frac{3}{4}$	$241\frac{8}{10}$	1983
105000	*t*†	3	1	127	$76\frac{18}{20}$	362	159	$86\frac{10}{20}$	452	$49\frac{1}{2}$	$42\frac{1}{20}$	330	$3\frac{8}{16}$	$176\frac{4}{10}$	$246\frac{9}{10}$	2057

* Where the equipment number lies between any two consecutive numbers given in the Table the equipment is to be governed by the greater.

Circ 1572 permits 2 wires equivalent to 1 lowline or 1 stream in vessels up to 4000 tons.

ANCHORS and CHAINS for STEAM VESSELS.

TABLE 53 (Concluded.)

*EQUIPMENT NUMBER.	Letters for Equipment as inserted in Register Book, Column 7	STREAM CHAIN OR STEEL WIRE.						TOWLINE, HEMP OR STEEL WIRE.				HAWSERS AND WARPS. HEMP OR STEEL WIRE.						
			Chain.			Steel Wire.			Hemp.	Steel Wire.			Hawsers.			Warps.		
		Length.	Size.	Minimum Weight. Stud Link.	Minimum Weight. Short Link.	Size.	Breaking Test.	Length.	Size.	Size.	Breaking Test.	Length of Each.	Number.	Hemp. Size.	Flexible Steel Wire Rope. Size. (b)	Number.	Hemp. Size.	Flexible Steel Wire Rope. Size. (b)
		Fathoms.	Inches.	Cwt.	Cwt.	Inches.	Tons.	Fathoms.	Inches.	Inches.	Tons.	Fathoms.		Inches.	Inches.		Inches.	Inches.
3000	*a*	45	$\frac{8}{16}$	$6\frac{1}{2}$	$7\frac{1}{4}$	—	—	75	$5\frac{1}{2}$	2	8·3	90	1	3	—	—	—	—
3600	*b*	45	$\frac{9}{16}$	8	$8\frac{3}{4}$	2	8·3	75	6	$2\frac{1}{4}$	10·8	90	1	4	—	—	—	—
4200	*c*	45	$\frac{9}{16}$	8	$8\frac{3}{4}$	2	8·3	75	6	$2\frac{1}{4}$	10·8	90	1	4	—	—	—	—
4800	*d*	45	$\frac{10}{16}$	$9\frac{3}{4}$	$10\frac{1}{2}$	$2\frac{1}{4}$	10·8	75	$6\frac{1}{2}$	$2\frac{1}{4}$	10·8	90	1	4	—	—	—	—
5400	*e*	45	$\frac{10}{16}$	$9\frac{3}{4}$	$10\frac{1}{2}$	$2\frac{1}{4}$	10·8	75	7	$2\frac{1}{2}$	13·2	90	1	5	$1\frac{3}{4}$	—	—	—
6000	*f*	45	$\frac{11}{16}$	11	12	$2\frac{1}{2}$	13·2	75	$7\frac{1}{2}$	$2\frac{1}{2}$	13·2	90	1	$5\frac{1}{2}$	2	—	—	—
6700	*g*	60	$\frac{11}{16}$	$14\frac{1}{2}$	$15\frac{3}{4}$	$2\frac{1}{2}$	13·2	75	$7\frac{1}{2}$	$2\frac{1}{2}$	13·2	90	1	$5\frac{1}{2}$	2	—	—	—
7400	*h*	60	$\frac{12}{16}$	$17\frac{1}{4}$	$18\frac{3}{4}$	$2\frac{3}{4}$	15·2	75	8	$2\frac{3}{4}$	15·2	90	1	6	$2\frac{1}{4}$	—	—	—
8100	*i*	60	$\frac{13}{16}$	$20\frac{1}{2}$	22	3	18·6	75	$8\frac{1}{2}$	$2\frac{3}{4}$	15·2	90	1	6	$2\frac{1}{4}$	—	—	—
8900	*j*	60	$\frac{13}{16}$	$20\frac{1}{2}$	22	3	18·6	75	$8\frac{1}{2}$	$2\frac{3}{4}$	15·2	90	1	6	$2\frac{1}{4}$	1	4	—
9700	*k*	60	$\frac{14}{16}$	$23\frac{1}{2}$	$25\frac{1}{2}$	$3\frac{1}{4}$	21·7	90	9	3	18·6	90	1	6	$2\frac{1}{4}$	1	5	$1\frac{3}{4}$
10600	*l*	60	$\frac{14}{16}$	$23\frac{1}{2}$	$25\frac{1}{2}$	$3\frac{1}{4}$	21·7	90	9	3	18·6	90	1	6	$2\frac{1}{4}$	1	5	$1\frac{3}{4}$
11600	*m*	60	$\frac{15}{16}$	27	29	$3\frac{1}{2}$	25·7	90	—	$3\frac{1}{4}$	21·7	90	1	6	$2\frac{1}{4}$	1	5	$1\frac{3}{4}$
12700	*n*	75	$\frac{15}{16}$	34	$35\frac{1}{2}$	$3\frac{1}{2}$	25·7	90	—	$3\frac{1}{4}$	21·7	90	1	6	$2\frac{1}{4}$	1	5	$1\frac{3}{4}$
13900	*o*	75	1	$38\frac{1}{4}$	$41\frac{1}{4}$	$3\frac{3}{4}$	29·3	90	—	$3\frac{1}{4}$	21·7	90	1	6	$2\frac{1}{4}$	1	5	$1\frac{3}{4}$
15200	*p*	75	1	$38\frac{1}{4}$	$41\frac{1}{4}$	$3\frac{3}{4}$	29·3	90	—	$3\frac{1}{4}$	21·7	90	2	6	$2\frac{1}{4}$	2	5	$1\frac{3}{4}$
16700	*q*	75	$1\frac{1}{16}$	$43\frac{1}{4}$	$46\frac{1}{4}$	4	33·2	90	—	$3\frac{1}{2}$	25·7	90	2	6	$2\frac{1}{4}$	2	5	$1\frac{3}{4}$
18500	*r*	75	$1\frac{1}{16}$	$43\frac{1}{4}$	$46\frac{1}{4}$	4	33·2	90	—	$3\frac{1}{2}$	25·7	90	2	6	$2\frac{1}{4}$	2	5	$1\frac{3}{4}$
20600	*s*	75	$1\frac{2}{16}$	$48\frac{1}{2}$	52	$4\frac{1}{4}$	36·4	90	—	4	33·2	90	2	7	$2\frac{1}{2}$	2	6	$2\frac{1}{4}$
22700	*t*	75	$1\frac{2}{16}$	$48\frac{1}{2}$	52	$4\frac{1}{4}$	36·4	100	—	4	33·2	90	2	7	$2\frac{1}{2}$	2	6	$2\frac{1}{4}$
25000	*u*	90	$1\frac{2}{16}$	$51\frac{1}{4}$	$62\frac{1}{4}$	$4\frac{1}{4}$	36·4	100	—	4	33·2	90	2	7	$2\frac{1}{2}$	2	6	$2\frac{1}{4}$
27300	*v*	90	$1\frac{3}{16}$	$65\frac{1}{4}$	$69\frac{3}{4}$	$4\frac{1}{2}$	43·3	120	—	4	33·2	90	2	7	$2\frac{1}{2}$	2	7	$2\frac{1}{2}$
29700	*w*	90	$1\frac{3}{16}$	$65\frac{1}{4}$	$69\frac{3}{4}$	$4\frac{1}{2}$	43·3	120	—	$4\frac{1}{2}$	43·3	90	2	7	$2\frac{1}{2}$	2	7	$2\frac{1}{2}$
32200	*x*	90	$1\frac{3}{16}$	$65\frac{1}{4}$	$69\frac{3}{4}$	$4\frac{1}{2}$	43·3	120	—	$4\frac{1}{2}$	43·3	90	2	7	$2\frac{1}{2}$	2	7	$2\frac{1}{2}$
34800	*y*	90	$1\frac{4}{16}$	72	77	$4\frac{3}{4}$	47·0	120	—	$4\frac{3}{4}$	47·0	90	2	8	$2\frac{3}{4}$	2	7	$2\frac{1}{2}$
37600	*z*	90	$1\frac{4}{16}$	72	77	$4\frac{3}{4}$	47·0	120	—	5	52·8	90	2	8	$2\frac{3}{4}$	2	7	$2\frac{1}{2}$
40400	*a*†	90	$1\frac{5}{16}$	$79\frac{1}{2}$	85	5	52·8	120	—	$4\frac{3}{4}$	64·6	90	2	8	$2\frac{3}{4}$	2	7	$2\frac{1}{2}$
43200	*b*†	120	$1\frac{5}{16}$	106	$113\frac{1}{4}$	5	52·8	130	—	5	70·9	100	2	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
46000	*c*†	120	$1\frac{5}{16}$	106	$113\frac{1}{4}$	5	52·8	130	—	$5\frac{1}{4}$	77·5	100	2	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
48800	*d*†	120	$1\frac{6}{16}$	116	124	$4\frac{3}{4}$	64·6	130	—	$5\frac{1}{2}$	84·4	100	2	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
51600	*e*†	120	$1\frac{6}{16}$	116	124	$4\frac{3}{4}$	64·6	130	—	$5\frac{1}{2}$	84·4	100	2	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
54600	*f*†	120	$1\frac{7}{16}$	$126\frac{3}{4}$	$135\frac{1}{2}$	5	70·9	130	—	$5\frac{1}{2}$	84·4	100	2	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
57600	*g*†	120	$1\frac{8}{16}$	$138\frac{1}{4}$	$146\frac{1}{2}$	$5\frac{1}{2}$	84·4	130	—	$6\frac{1}{2}$	112·3	100	2	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
60600	*h*†	120	$1\frac{8}{16}$	$138\frac{1}{4}$	$146\frac{1}{2}$	$5\frac{1}{2}$	84·4	130	—	$6\frac{1}{2}$	112·3	120	2	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
63800	*i*†	120	$1\frac{9}{16}$	$149\frac{1}{4}$	159	$5\frac{1}{2}$	84·4	130	—	$6\frac{1}{2}$	112·3	120	2	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
67000	*j*†	120	$1\frac{10}{16}$	$159\frac{3}{4}$	$171\frac{1}{2}$	$5\frac{1}{2}$	84·4	130	—	$6\frac{1}{2}$	112·3	120	2	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
70200	*k*†	150	$1\frac{11}{16}$	$215\frac{1}{2}$	$231\frac{1}{2}$	6	99·1	140	—	7	130·7	120	3	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
73400	*l*†	150	$1\frac{12}{16}$	$231\frac{1}{2}$	$249\frac{1}{2}$	6	99·1	140	—	7	130·7	120	3	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
76800	*m*†	150	$1\frac{13}{16}$	$248\frac{1}{2}$	$268\frac{1}{2}$	6	99·1	140	—	7	130·7	120	3	8	$2\frac{3}{4}$	2	8	$2\frac{3}{4}$
80200	*n*†	150	$1\frac{13}{16}$	$248\frac{1}{2}$	$268\frac{1}{2}$	6	99·1	140	—	7	130·7	120	3	8	$2\frac{3}{4}$	3	8	$2\frac{3}{4}$
83800	*o*†	150	$1\frac{14}{16}$	$265\frac{3}{4}$	288	$6\frac{1}{2}$	112·3	140	—	7	130·7	120	3	8	$2\frac{3}{4}$	3	8	$2\frac{3}{4}$
87600	*p*†	150	$1\frac{14}{16}$	$265\frac{3}{4}$	288	$6\frac{1}{2}$	112·3	140	—	7	130·7	120	3	8	$2\frac{3}{4}$	3	8	$2\frac{3}{4}$
91600	*q*†	150	$1\frac{15}{16}$	284	309	$6\frac{1}{2}$	112·3	150	—	8	148·8	120	3	8	$2\frac{3}{4}$	3	8	$2\frac{3}{4}$
95800	*r*†	150	$1\frac{15}{16}$	284	309	$6\frac{1}{2}$	112·3	150	—	8	148·8	120	3	8	$2\frac{3}{4}$	3	8	$2\frac{3}{4}$
100200	*s*†	150	2	$299\frac{1}{4}$	330	7	130·7	150	—	8	148·8	120	3	8	$2\frac{3}{4}$	3	8	$2\frac{3}{4}$
105000	*t*†	150	2	$299\frac{1}{4}$	330	7	130·7	150	—	8	148·8	120	3	8	$2\frac{3}{4}$	3	8	$2\frac{3}{4}$

* Where the equipment number lies between any two consecutive numbers given in the Table the equipment is to be governed by the greater.

(*b*) 6×12 Flexible Steel Wire Ropes. (*c*) 6×24 Special Flexible Steel Wire Ropes. (*d*) 6×30 Special Flexible Steel Wire Ropes.

ANCHORS and CHAINS for SAILING VESSELS.

TABLE 54

(See Continuation.)

* EQUIPMENT NUMBER.	Letters for Equipment as inserted in Register Book, Column 8	ANCHORS.									CHAIN CABLES.				
		Number.			Bower Anchors. Ex Stock.			Stream and Kedge Anchors. Ex Stock.			Stud Chain Cables.				
		Bowers.	Stream.	Kedge.	Weight.	Test.	Collective Weight.	Stream.	Test.	Kedge.	Test.	Length.	Minimum Size.	Proved to Statutory Test.	Breaking Test.	Minimum Weight.
					Cwts.	Tons.	Cwts.	Cwts.	Tons.	Cwts.	Tons.	Fms.	Inches.	Tons.	Tons.	Cwts.
2100	*a*	2	1	1	$3\frac{1}{2}$	$5\frac{18}{20}$	7	$\frac{3}{4}$	—	$\frac{1}{2}$	—	120	$\frac{11}{16}$	$8\frac{5}{10}$	$12\frac{3}{4}$	29
2500	*b*	2	1	1	$4\frac{1}{4}$	$6\frac{12}{20}$	$8\frac{1}{2}$	$1\frac{1}{4}$	$3\frac{13}{20}$	$\frac{1}{2}$	—	120	$\frac{12}{16}$	$10\frac{1}{8}$	$15\frac{1}{8}$	$34\frac{1}{2}$
3000	*c*	2	1	1	5	$7\frac{7}{20}$	10	$1\frac{1}{2}$	$3\frac{18}{20}$	$\frac{3}{4}$	—	135	$\frac{13}{16}$	$11\frac{7}{8}$	$17\frac{8}{10}$	46
3400	*d*	2	1	1	$5\frac{3}{4}$	8	$11\frac{1}{2}$	$1\frac{1}{2}$	$3\frac{18}{20}$	$\frac{3}{4}$	—	165	$\frac{14}{16}$	$13\frac{3}{4}$	$20\frac{5}{8}$	$64\frac{1}{4}$
3900	*e*	2	1	1	$6\frac{1}{2}$	$8\frac{15}{20}$	13	2	$4\frac{10}{20}$	1	—	165	$\frac{15}{16}$	$15\frac{8}{10}$	$23\frac{7}{10}$	$74\frac{1}{2}$
4300	*f*	2	1	1	$7\frac{1}{4}$	$9\frac{9}{20}$	$14\frac{1}{2}$	$2\frac{1}{4}$	$4\frac{15}{20}$	1	—	165	1	18	27	84
4800	*g*	3	1	1	$8\frac{1}{4}$	$10\frac{7}{20}$	$23\frac{1}{2}$	$2\frac{1}{2}$	5	$1\frac{1}{4}$	$3\frac{13}{20}$	165	$1\frac{1}{16}$	$20\frac{3}{10}$	$30\frac{4}{10}$	$95\frac{1}{4}$
5300	*h*	3	1	1	10	12	$28\frac{1}{2}$	$3\frac{3}{4}$	$6\frac{3}{20}$	$1\frac{3}{4}$	$4\frac{4}{20}$	195	$1\frac{2}{16}$	$22\frac{3}{4}$	$34\frac{1}{8}$	$126\frac{1}{4}$
5900	*i*	3	1	1	12	$13\frac{17}{20}$	$34\frac{1}{4}$	4	$6\frac{7}{20}$	2	$4\frac{10}{20}$	195	$1\frac{3}{16}$	$25\frac{3}{8}$	38	$141\frac{1}{4}$
6500	*j*	3	1	1	$13\frac{1}{2}$	$15\frac{3}{20}$	$38\frac{1}{2}$	$4\frac{3}{4}$	$7\frac{2}{20}$	$2\frac{1}{2}$	5	210	$1\frac{4}{16}$	$28\frac{1}{8}$	$42\frac{1}{8}$	168
7100	*k*	3	1	1	$15\frac{1}{4}$	$16\frac{14}{20}$	$43\frac{1}{2}$	$5\frac{1}{4}$	$7\frac{11}{20}$	$2\frac{1}{2}$	5	210	$1\frac{5}{16}$	31	$46\frac{1}{2}$	$185\frac{1}{2}$
7700	*l*	3	1	1	17	$18\frac{5}{20}$	$48\frac{1}{2}$	$5\frac{1}{2}$	$7\frac{16}{20}$	$2\frac{3}{4}$	$5\frac{5}{20}$	240	$1\frac{6}{16}$	34	51	$232\frac{1}{4}$
8400	*m*	3	1	1	19	$19\frac{17}{20}$	54	$6\frac{1}{2}$	$8\frac{15}{20}$	$3\frac{1}{4}$	$5\frac{14}{20}$	240	$1\frac{7}{16}$	$37\frac{1}{8}$	$55\frac{5}{8}$	$254\frac{1}{4}$
9200	*n*	3	1	1	21	$21\frac{12}{20}$	60	$7\frac{1}{4}$	$9\frac{9}{20}$	$3\frac{1}{2}$	$5\frac{18}{20}$	240	$1\frac{8}{16}$	$40\frac{5}{10}$	$58\frac{7}{10}$	$276\frac{3}{4}$
10100	*o*	3	1	1	$23\frac{1}{2}$	$23\frac{10}{20}$	67	8	$10\frac{2}{20}$	4	$6\frac{7}{20}$	270	$1\frac{9}{16}$	$43\frac{9}{10}$	$61\frac{4}{10}$	336
11100	*p*	3	1	1	$25\frac{1}{2}$	$25\frac{3}{20}$	$72\frac{3}{4}$	$8\frac{1}{2}$	$10\frac{12}{20}$	$4\frac{1}{4}$	$6\frac{12}{20}$	270	$1\frac{10}{16}$	$47\frac{5}{10}$	$66\frac{5}{10}$	$359\frac{1}{2}$
12300	*q*	3	1	1	$27\frac{3}{4}$	$26\frac{18}{20}$	79	$8\frac{3}{4}$	$10\frac{17}{20}$	$4\frac{1}{2}$	$6\frac{17}{20}$	270	$1\frac{11}{16}$	$51\frac{1}{4}$	$71\frac{3}{4}$	$387\frac{3}{4}$
13600	*r*	3	1	1	30	$28\frac{12}{20}$	$85\frac{1}{2}$	$9\frac{1}{2}$	$11\frac{11}{20}$	$4\frac{3}{4}$	$7\frac{2}{20}$	270	$1\frac{12}{16}$	$55\frac{1}{8}$	$77\frac{1}{8}$	$416\frac{3}{4}$
15100	*s*	3	1	1	32	$30\frac{2}{20}$	$91\frac{1}{4}$	$10\frac{1}{2}$	$12\frac{8}{20}$	$5\frac{1}{4}$	$7\frac{11}{20}$	270	$1\frac{13}{16}$	$59\frac{1}{8}$	$82\frac{3}{4}$	$447\frac{1}{2}$
16800	*t*	3	1	1	34	$31\frac{12}{20}$	97	$10\frac{3}{4}$	$12\frac{13}{20}$	$5\frac{1}{2}$	$7\frac{16}{20}$	270	$1\frac{14}{16}$	$63\frac{1}{4}$	$88\frac{5}{10}$	$478\frac{1}{2}$
18600	*u*	3	1	1	$36\frac{1}{2}$	$33\frac{8}{20}$	104	$11\frac{1}{4}$	$13\frac{2}{20}$	$5\frac{1}{2}$	$7\frac{16}{20}$	270	$1\frac{15}{16}$	$67\frac{5}{10}$	$94\frac{5}{10}$	$511\frac{1}{2}$
20500	*v*	3	1	1	38	$34\frac{10}{20}$	$108\frac{1}{4}$	$11\frac{1}{2}$	$13\frac{7}{20}$	$5\frac{3}{4}$	8	270	2	72	$100\frac{8}{10}$	$538\frac{3}{4}$
22700	*w*	3	1	1	40	$35\frac{15}{20}$	114	12	$13\frac{17}{20}$	6	$8\frac{5}{20}$	270	$2\frac{1}{16}$	$76\frac{5}{10}$	$107\frac{1}{10}$	$573\frac{3}{4}$
25200	*x*	3	1	1	42	$37\frac{2}{20}$	$119\frac{3}{4}$	$13\frac{1}{2}$	$15\frac{3}{20}$	$6\frac{3}{4}$	9	300	$2\frac{3}{16}$	$86\frac{1}{8}$	$120\frac{5}{10}$	$717\frac{1}{2}$
27900	*y*	3	1	1	45	$39\frac{5}{20}$	$128\frac{1}{4}$	$15\frac{1}{4}$	$16\frac{14}{20}$	$7\frac{1}{2}$	$9\frac{13}{20}$	300	$2\frac{5}{16}$	$96\frac{1}{4}$	$134\frac{3}{4}$	801
30800	*z*	3	1	1	48	$41\frac{2}{20}$	137	17	$18\frac{5}{20}$	$8\frac{1}{2}$	$10\frac{12}{20}$	300	$2\frac{6}{16}$	$101\frac{1}{2}$	$142\frac{1}{10}$	$844\frac{1}{4}$

* Where the equipment number lies between any two consecutive numbers given in the Table the equipment is to be governed by the greater.

ANCHORS and CHAINS for SAILING VESSELS.

TABLE 54 *(Concluded.)*

*EQUIPMENT NUMBER.	Letters for Equipment as inserted in Register Book, Column 8	STREAM, CHAIN OR STEEL WIRE.						TOWLINE HEMP OR STEEL WIRE.				HAWSERS AND WARPS. HEMP OR STEEL WIRE.						
			Chain.			Flexible Steel Wire Rope.				Flexible Steel Wire Rope.			Hawsers.			Warps.		
		Length.	Size.	Minimum Weight.		Size. (*b*)	Breaking Test.	Length.	Hemp. Size.	Size. (*b*)	Breaking Test.	Length of Each.	Number.	Hemp. Size.	Flexible Steel Wire Rope. Size. (*b*)	Number.	Hemp. Size.	Flexible Steel Wire Rope. Size. (*b*)
				Stud Link.	Short Link.													
		Fathoms.	Inches.	Cwt.	Cwt.	Inches.	Tons.	Fathoms.	Inches.	Inches.	Tons.	Fathoms.		Inches.	Inches.		Inches.	Inches.
2100	*a*	45	$\frac{7}{16}$	$5\frac{1}{4}$	$5\frac{3}{4}$	—	—	75	5	$1\frac{3}{4}$	6·4	90	1	3	—	—	—	—
2500	*b*	45	$\frac{8}{16}$	$6\frac{1}{2}$	$7\frac{1}{4}$	—	—	75	$5\frac{1}{2}$	2	8·3	90	1	3	—	—	—	—
3000	*c*	45	$\frac{8}{16}$	$6\frac{1}{2}$	$7\frac{1}{4}$	—	—	75	$5\frac{1}{2}$	2	8·3	90	1	3	—	—	—	—
3400	*d*	45	$\frac{8}{16}$	$6\frac{1}{2}$	$7\frac{1}{4}$	—	—	75	6	$2\frac{1}{4}$	10·8	90	1	$3\frac{1}{2}$	—	—	—	—
3900	*e*	45	$\frac{9}{16}$	8	$8\frac{3}{4}$	2	8·3	75	$6\frac{1}{2}$	$2\frac{1}{4}$	10·8	90	1	4	—	—	—	—
4300	*f*	45	$\frac{9}{16}$	8	$8\frac{3}{4}$	2	8·3	75	$6\frac{1}{2}$	$2\frac{1}{4}$	10·8	90	1	4	—	—	—	—
4800	*g*	45	$\frac{10}{16}$	$9\frac{3}{4}$	$10\frac{1}{2}$	$2\frac{1}{4}$	10·8	75	7	$2\frac{1}{2}$	13·2	90	1	4	—	—	—	—
5300	*h*	45	$\frac{10}{16}$	$9\frac{3}{4}$	$10\frac{1}{2}$	$2\frac{1}{4}$	10·8	75	$7\frac{1}{2}$	$2\frac{1}{2}$	13·2	90	1	5	$1\frac{3}{4}$	—	—	—
5900	*i*	60	$\frac{11}{16}$	$14\frac{1}{2}$	$15\frac{3}{4}$	$2\frac{3}{4}$	15·2	75	8	$2\frac{3}{4}$	15·2	90	1	$5\frac{1}{2}$	2	—	—	—
6500	*j*	60	$\frac{11}{16}$	$14\frac{1}{2}$	$15\frac{3}{4}$	$2\frac{3}{4}$	15·2	75	8	$2\frac{3}{4}$	15·2	90	1	$5\frac{1}{2}$	2	—	—	—
7100	*k*	60	$\frac{12}{16}$	$17\frac{1}{4}$	$18\frac{3}{4}$	$2\frac{3}{4}$	15·2	75	$8\frac{1}{2}$	$2\frac{3}{4}$	15·2	90	1	6	$2\frac{1}{4}$	—	—	—
7700	*l*	60	$\frac{12}{16}$	$17\frac{1}{4}$	$18\frac{3}{4}$	$2\frac{3}{4}$	15·2	75	9	3	18·6	90	1	$6\frac{1}{2}$	$2\frac{1}{4}$	—	—	—
8400	*m*	60	$\frac{13}{16}$	$20\frac{1}{4}$	22	3	18·6	75	—	$3\frac{1}{4}$	21·7	90	1	7	$2\frac{1}{2}$	—	—	—
9200	*n*	60	$\frac{13}{16}$	$20\frac{1}{4}$	22	3	18·6	90	—	$3\frac{1}{4}$	21·7	90	1	7	$2\frac{1}{2}$	1	4	—
10100	*o*	60	$\frac{14}{16}$	$23\frac{1}{2}$	$25\frac{1}{2}$	$3\frac{1}{4}$	21·7	90	—	$3\frac{1}{4}$	21·7	90	1	8	$2\frac{3}{4}$	1	5	$1\frac{3}{4}$
11100	*p*	75	$\frac{14}{16}$	$29\frac{1}{4}$	$31\frac{1}{2}$	$3\frac{1}{4}$	21·7	90	—	$3\frac{1}{4}$	21·7	90	1	8	$2\frac{3}{4}$	1	5	$1\frac{3}{4}$
12300	*q*	75	$\frac{15}{16}$	34	$36\frac{1}{2}$	$3\frac{1}{2}$	25·7	90	—	$3\frac{1}{4}$	21·7	90	1	9	3	1	$5\frac{1}{2}$	2
13600	*r*	75	$\frac{15}{16}$	34	$36\frac{1}{2}$	$3\frac{1}{2}$	25·7	90	—	$3\frac{1}{4}$	21·7	90	1	9	3	1	$5\frac{1}{2}$	2
15100	*s*	75	1	$38\frac{1}{4}$	$41\frac{1}{4}$	$3\frac{3}{4}$	29·3	90	—	$3\frac{1}{2}$	25·7	90	1	—	$3\frac{1}{4}$	1	6	$2\frac{1}{4}$
16800	*t*	75	1	$38\frac{1}{4}$	$41\frac{1}{4}$	$3\frac{3}{4}$	29·3	90	—	$3\frac{1}{2}$	25·7	90	1	—	$3\frac{1}{4}$	1	6	$2\frac{1}{4}$
18600	*u*	75	$1\frac{1}{16}$	$43\frac{1}{4}$	$46\frac{1}{4}$	4	33·2	90	—	$3\frac{1}{2}$	25·7	90	1	—	$3\frac{1}{4}$	1	$6\frac{1}{2}$	$2\frac{1}{4}$
20500	*v*	75	$1\frac{1}{16}$	$43\frac{1}{4}$	$46\frac{1}{4}$	4	33·2	90	—	4	33·2	90	1	—	$3\frac{1}{2}$	1	7	$2\frac{1}{2}$
22700	*w*	100	$1\frac{2}{16}$	$64\frac{3}{4}$	$69\frac{1}{2}$	$4\frac{1}{4}$	36·4	90	—	4	33·2	90	1	—	$3\frac{1}{2}$	1	7	$2\frac{1}{2}$
25200	*x*	120	$1\frac{2}{16}$	$77\frac{3}{4}$	$83\frac{1}{2}$	$4\frac{1}{4}$	36·4	90	—	$4\frac{1}{2}$	43·3	90	1	—	4	1	8	$2\frac{3}{4}$
27900	*y*	120	$1\frac{3}{16}$	87	93	$4\frac{1}{2}$	43·3	90	—	$4\frac{1}{2}$	43·3	90	1	—	4	1	8	$2\frac{3}{4}$
30800	*z*	120	$1\frac{4}{16}$	96	103	$4\frac{3}{4}$	47·0	120	—	$4\frac{3}{4}$	47·0	90	1	—	$4\frac{1}{2}$	1	9	3

* Where the equipment number lies between any two consecutive numbers given in the Table the equipment is to be governed by the greater.

(*b*) 6 × 12 Flexible Steel Wire Ropes.

EQUIPMENT for TUGS. TABLE 55

*SECOND LONGITUDINAL NUMERAL L×(B+D)	ANCHORS.					CHAIN.				HAWSERS.		WARPS.	
	Number.	Weight Ex Stock.		Weight Stockless.		Length.	Diameter.	Minimum Weight.		Length.	Size.	Length.	Size.
		1st Bower.	2nd Bower.	1st Bower.	2nd Bower.			Stud Link.	Short Link.				
		Cwts.	Cwts.	Cwts.	Cwts.	Fathoms.	Inches.	Cwts.	Cwts.	Fathoms.	Inches.	Fathoms.	Inches.
1440	2	$2\frac{1}{4}$	$2\frac{1}{4}$	3	3	60	$\frac{10}{16}$	13	14	60	$4\frac{1}{2}$	60	$2\frac{1}{2}$
1710	2	$2\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{4}$	$3\frac{1}{4}$	60	$\frac{11}{16}$	$14\frac{1}{2}$	$15\frac{3}{4}$	60	$4\frac{1}{2}$	60	$2\frac{1}{2}$
1980	2	$2\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	60	$\frac{11}{16}$	$14\frac{1}{2}$	$15\frac{3}{4}$	60	$4\frac{1}{2}$	60	$2\frac{1}{2}$
2250	2	3	3	$3\frac{3}{4}$	$3\frac{3}{4}$	60	$\frac{12}{16}$	$17\frac{1}{4}$	$18\frac{3}{4}$	60	5	60	$2\frac{1}{2}$
2620	2	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{1}{2}$	60	$\frac{13}{16}$	$20\frac{1}{2}$	22	60	$5\frac{1}{2}$	60	3
2950	2	4	4	5	5	60	$\frac{14}{16}$	$23\frac{1}{2}$	$25\frac{1}{2}$	60	$5\frac{1}{2}$	60	3
3230	2	$4\frac{1}{4}$	4	$5\frac{1}{4}$	5	60	$\frac{14}{16}$	$23\frac{1}{2}$	$25\frac{1}{2}$	60	$5\frac{1}{2}$	60	$3\frac{1}{2}$
3510	2	$4\frac{1}{2}$	4	$5\frac{1}{2}$	5	75	$\frac{15}{16}$	34	$36\frac{1}{2}$	60	$5\frac{1}{2}$	60	$3\frac{1}{2}$
3790	2	$4\frac{3}{4}$	$4\frac{1}{4}$	6	$5\frac{1}{4}$	90	$\frac{15}{16}$	$40\frac{3}{4}$	$43\frac{3}{4}$	60	$5\frac{1}{2}$	60	4
4040	2	5	$4\frac{1}{2}$	$6\frac{1}{4}$	$5\frac{1}{2}$	90	1	46	$49\frac{1}{2}$	60	$5\frac{1}{2}$	60	4
4290	2	$5\frac{1}{4}$	$4\frac{3}{4}$	$6\frac{1}{2}$	6	90	1	46	$49\frac{1}{2}$	60	6	60	$4\frac{1}{2}$
4530	2	$5\frac{1}{2}$	5	7	$6\frac{1}{4}$	105	$1\frac{1}{16}$	$60\frac{3}{4}$	65	60	6	60	$4\frac{1}{2}$
4770	2	$5\frac{3}{4}$	$5\frac{1}{4}$	$7\frac{1}{4}$	$6\frac{1}{2}$	105	$1\frac{1}{16}$	$60\frac{3}{4}$	65	60	6	60	5
5010	2	6	$5\frac{1}{2}$	$7\frac{1}{2}$	7	120	$1\frac{2}{16}$	$77\frac{3}{4}$	$83\frac{1}{2}$	60	6	60	5
5260	2	$6\frac{1}{4}$	$5\frac{3}{4}$	8	$7\frac{1}{4}$	120	$1\frac{2}{16}$	$77\frac{3}{4}$	$83\frac{1}{2}$	60	6	60	5
5570	2	$6\frac{1}{2}$	6	$8\frac{1}{4}$	$7\frac{1}{2}$	120	$1\frac{2}{16}$	$77\frac{3}{4}$	$83\frac{1}{2}$	60	6	60	5
5900	2	$6\frac{3}{4}$	$6\frac{1}{4}$	$8\frac{1}{2}$	8	120	$1\frac{3}{16}$	87	$93\frac{1}{4}$	60	7	60	5
6200	2	7	$6\frac{1}{2}$	$8\frac{3}{4}$	$8\frac{1}{4}$	120	$1\frac{3}{16}$	87	$93\frac{1}{4}$	60	7	60	$5\frac{1}{2}$
6560	2	$7\frac{1}{4}$	$6\frac{3}{4}$	9	$8\frac{1}{2}$	135	$1\frac{3}{16}$	$97\frac{3}{4}$	$104\frac{3}{4}$	60	7	60	$5\frac{1}{2}$
6890	2	$7\frac{1}{2}$	7	$9\frac{1}{4}$	$8\frac{3}{4}$	135	$1\frac{3}{16}$	$97\frac{3}{4}$	$104\frac{3}{4}$	60	7	60	$5\frac{1}{2}$
7220	2	$7\frac{3}{4}$	$7\frac{1}{4}$	$9\frac{1}{2}$	9	150	$1\frac{3}{16}$	$108\frac{1}{2}$	$116\frac{1}{2}$	60	7	60	$5\frac{1}{2}$
7550	2	8	$7\frac{1}{2}$	10	$9\frac{1}{2}$	150	$1\frac{4}{16}$	120	$128\frac{1}{2}$	60	7	60	$5\frac{1}{2}$

* Where the equipment number lies between any two consecutive numbers given in the Table the equipment is to be governed by the greater.

LLOYD'S REGISTER OF SHIPPING, LONDON.—16*th June*, 1927.

RENEWAL of CHAIN CABLES when WORN. TABLE 56

When any length of a Chain Cable is so worn that the mean diameter at its most worn part is reduced to the size given in the following Table, it is to be renewed.

ORIGINAL DIAMETER OF CHAIN CABLE.	MEAN DIAMETER REQUIRING RENEWAL OF CHAIN CABLE.	ORIGINAL DIAMETER OF CHAIN CABLE.	MEAN DIAMETER REQUIRING RENEWAL OF CHAIN CABLE.	ORIGINAL DIAMETER OF CHAIN CABLE.	MEAN DIAMETER REQUIRING RENEWAL OF CHAIN CABLE.	ORIGINAL DIAMETER OF CHAIN CABLE.	MEAN DIAMETER REQUIRING RENEWAL OF CHAIN CABLE.
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
$\frac{11}{16}$	$\frac{10}{16}$	$1\frac{4}{16}$	$1\frac{2}{16}$	$1\frac{13}{16}$	$1\frac{10}{16}$	$2\frac{6}{16}$	$2\frac{2}{16}$
$\frac{12}{16}$	$\frac{21}{32}$	$1\frac{5}{16}$	$1\frac{3}{16}$	$1\frac{14}{16}$	$1\frac{11}{16}$	$2\frac{7}{16}$	$2\frac{3}{16}$
$\frac{13}{16}$	$\frac{23}{32}$	$1\frac{6}{16}$	$1\frac{7}{32}$	$1\frac{15}{16}$	$1\frac{23}{32}$	$2\frac{8}{16}$	$2\frac{4}{16}$
$\frac{14}{16}$	$\frac{25}{32}$	$1\frac{7}{16}$	$1\frac{9}{32}$	2	$1\frac{25}{32}$	$2\frac{9}{16}$	$2\frac{9}{32}$
$\frac{15}{16}$	$\frac{27}{32}$	$1\frac{8}{16}$	$1\frac{11}{32}$	$2\frac{1}{16}$	$1\frac{27}{32}$	$2\frac{10}{16}$	$2\frac{11}{32}$
1	$\frac{29}{32}$	$1\frac{9}{16}$	$1\frac{13}{32}$	$2\frac{2}{16}$	$1\frac{29}{32}$	$2\frac{11}{16}$	$2\frac{13}{32}$
$1\frac{1}{16}$	$\frac{15}{16}$	$1\frac{10}{16}$	$1\frac{15}{32}$	$2\frac{3}{16}$	$1\frac{31}{32}$	$2\frac{12}{16}$	$2\frac{15}{32}$
$1\frac{2}{16}$	1	$1\frac{11}{16}$	$1\frac{8}{16}$	$2\frac{4}{16}$	2	$2\frac{13}{16}$	$2\frac{17}{32}$
$1\frac{3}{16}$	$1\frac{1}{16}$	$1\frac{12}{16}$	$1\frac{9}{16}$	$2\frac{5}{16}$	$2\frac{1}{16}$	$2\frac{14}{16}$	$2\frac{9}{16}$

LLOYD'S REGISTER OF SHIPPING, LONDON.—13*th July*, 1922.

TABLES

OF

SCANTLINGS FOR VESSELS INTENDED TO CARRY PETROLEUM IN BULK.

(See pages 75—87)

The scantlings of sectional materials used in the Tables are British Standard Sections. Where it is proposed to use sectional materials complying with the revised British Standards described on pages 411-413 of the Rules, the Committee will be prepared to accept scantlings for such sections on the basis of equivalent strength.

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BOTTOM TRANSVERSES.

SPACING OF TRANSVERSES 8 FEET.

TABLE 1

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET. 30	32	34	36	38	40
Feet. 16	Plate	Inches. 26 × ·36	Inches. 26 × ·36	Inches. 27 × ·36	Inches.	Inches.	Inches.
	Face Angle	$3\frac{1}{2} \times 3\frac{1}{2} \times ·40$	$3\frac{1}{2} \times 3\frac{1}{2} \times ·40$	$4 \times 3\frac{1}{2} \times ·44$			
18	Plate		28 × ·36	28 × ·36	28 × ·36	29 × ·38	
	Face Angle		$3\frac{1}{2} \times 3\frac{1}{2} \times ·40$	$4 \times 3\frac{1}{2} \times ·48$	$5 \times 3\frac{1}{2} \times ·50$	$5 \times 3\frac{1}{2} \times ·54$	
20	Plate			28 × ·38	28 × ·38	29 × ·38	30 × ·38
	Face Angle			$5 \times 3\frac{1}{2} \times ·48$	$5 \times 3\frac{1}{2} \times ·54$	5 × 4 × ·54	6 × 4 × ·52
22	Plate				29 × ·38	30 × ·38	30 × ·38
	Face Angle				$5 \times 3\frac{1}{2} \times ·54$	5 × 4 × ·54	6 × 4 × ·56
24	Plate						31 × ·40
	Face Angle						6 × 4 × ·52
26	Plate						
	Face Angle						
28	Plate						
	Face Angle						

DEPTH. D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET. 42	44	46	48	50	52
Feet. 22	Plate	Inches. 32 × ·40	Inches. 33 × ·40	Inches.	Inches.	Inches.	Inches.
	Face Angle	6 × 4 × ·56	6 × 4 × ·60				
24	Plate	32 × ·40	33 × ·40	34 × ·42			
	Face Angle or Bulb Angle	6 × 4 × ·58	6 × 4 × ·62	$7 \times 3\frac{1}{2} \times ·54$			
26	Plate	33 × ·42	34 × ·42	34 × ·42	35 × ·42	36 × ·42	
	Face Angle or Bulb Angle	6 × 4 × ·56	6 × 4 × ·58	$7 \times 3\frac{1}{2} \times ·58$	$8 \times 3\frac{1}{2} \times ·54$	$8 \times 3\frac{1}{2} \times ·56$	
28	Plate			35 × ·44	36 × ·44	37 × ·44	39 × ·44
	Face Bulb Angle			$7 \times 3\frac{1}{2} \times ·56$	$8 \times 3\frac{1}{2} \times ·52$	$8 \times 3\frac{1}{2} \times ·54$	$8 \times 3\frac{1}{2} \times ·50$
30	Plate				36 × ·44	38 × ·44	40 × ·44
	Face Bulb Angle				$8 \times 3\frac{1}{2} \times ·54$	$8 \times 3\frac{1}{2} \times ·52$	$8 \times 3\frac{1}{2} \times ·50$
32	Plate						41 × ·46
	Face Bulb Angle						8 × $3\frac{1}{2}$ × ·50

BOTTOM TRANSVERSES.

SPACING OF TRANSVERSES 8 FEET.

TABLE 1

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET.					
		54	56	58	60	62	64
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
30	Plate Face Bulb Angle	41 × ·46 8 × 3½ × ·54	42 × ·46 8 × 3½ × ·56				
32	Plate Face Bulb Angle	42 × ·46 8 × 3½ × ·50	43 × ·46 8 × 3½ × ·52	44 × ·46 8 × 3½ × ·56			
34	Plate Face Bulb Angle	42 × ·46 8 × 3½ × ·52	43 × ·46 8 × 3½ × ·54	44 × ·46 8 × 3½ × ·58	46 × ·46 8 × 3½ × ·56	48 × ·46 8 × 3½ × ·54	49 × ·46. 8 × 3½ × ·58.
36	Plate Face Bulb Angle		46 × ·46. 8 × 3½ × ·48	46 × ·46 8 × 3½ × ·52	47 × ·46 8 × 3½ × ·56	49 × ·46 8 × 3½ × ·54	50 × ·48 8 × 3½ × ·58
38	Plate Face Bulb Angle			49 × ·46 8 × 3½ × ·52.	48 × ·48 8 × 3½ × ·56	50 × ·48 8 × 3½ × ·54	51 × ·48 8 × 3½ × ·56
40	Plate Face Bulb Angle					51 × ·48 8 × 3½ × ·54	52 × ·48 8 × 3½ × ·56
42	Plate Face Bulb Angle						53 × ·50 8 × 3½ × ·56

DEPTH. D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET.					
		66	68	70	72	74	76
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
36	Plate Face Bulb Angle						
38	Plate Face Bulb Angle	53 × ·48 8 × 3½ × ·56	54 × ·48 9 × 3½ × ·52				
40	Plate Face Bulb Angle	54 × ·48 9 × 3½ × ·50	55 × ·50 9 × 3½ × ·52	56 × ·50 9 × 3½ × ·56			
42	Plate Face Bulb Angle	54 × ·50 9 × 3½ × ·52	56 × ·50 9 × 3½ × ·52	57 × ·50 9 × 3½ × ·54	58 × ·50 9 × 3½ × ·58		
44	Plate Face Bulb Angle	55 × ·50 9 × 3½ × ·52	56 × ·50 9 × 3½ × ·56	58 × ·50 9 × 3½ × ·54	59 × ·50 9 × 3½ × ·56	60 × ·50 9 × 3½ × ·60	
46	Place Face Bulb Angle	56 × ·50 9 × 3½ × ·52	57 × ·50 9 × 3½ × ·56	59 × ·50 9 × 3½ × ·54	60 × ·50 9 × 3½ × ·56	61 × ·50 9 × 3½ × ·58	62 × ·50 9 × 3½ × ·62

BOTTOM TRANSVERSES.

SPACING OF TRANSVERSES 10 FEET.

TABLE 1

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET.					
		30	32	34	36	38	40
Feet. 16	Plate Face Angle	Inches. 27 × ·36 5 × 3½ × ·44	Inches. 27 × ·36 5 × 3½ × ·46	Inches. 28 × ·36 5 × 3½ × ·50	Inches.	Inches.	Inches.
18	Plate Face Angle		28 × ·36 5 × 3½ × ·50	29 × ·38 5 × 4 × ·52	30 × ·38 5 × 4 × ·56	31 × ·38 6 × 4 × ·56	
20	Plate Face Angle			30 × ·38 5 × 4 × ·52	30 × ·38 6 × 4 × ·54	32 × ·40 6 × 4 × ·54	32 × ·40 6 × 4 × ·56
22	Plate Face Angle				31 × ·38 6 × 4 × ·52	32 × ·40 6 × 4 × ·56	34 × ·42 6 × 4 × ·58
24	Plate Face Angle						35 × ·42 6 × 4 × ·56
26	Plate Face Angle						
28	Plate Face Angle						

DEPTH. D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET.					
		42	44	46	48	50	52
Feet. 22	Plate Face Angle or Bulb Angle	Inches 35 × ·42 6 × 4 × ·62	Inches. 36 × ·42 7 × 3½ × ·58	Inches.	Inches.	Inches.	Inches.
24	Plate Face Angle or Bulb Angle	36 × ·42 6 × 4 × ·58	37 × ·44 7 × 3½ × ·54	38 × ·44 7 × 3½ × ·56			
26	Plate Face Angle or Bulb Angle	36 × ·42 6 × 4 × ·60	37 × ·44 7 × 3½ × ·56	38 × ·44 8 × 3½ × ·52	39 × ·44 8 × 3½ × ·56	40 × ·44 9 × 3½ × ·54	
28	Plate Face Bulb Angle			39 × ·44 8 × 3½ × ·50	40 × ·44 8 × 3½ × ·54	41 × ·46 9 × 3½ × ·52	42 × ·46 9 × 3½ × ·56
30	Plate Face Bulb Angle				40 × ·46 8 × 3½ × ·56	41 × ·46 9 × 3½ × ·56	42 × ·46 9 × 3½ × ·60
32	Plate Face Bulb Angle						43 × ·46 9 × 3½ × ·56

BOTTOM TRANSVERSES.

SPACING OF TRANSVERSES 10 FEET.

TABLE 1

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET.					
		54	56	58	60	62	64
Feet. 30	Plate Face Bulb Angle	Inches. 43 × ·46 9 × 3½ × ·64	Inches. 45 × ·46 9 × 3½ × ·62	Inches.	Inches.	Inches.	Inches.
32	Plate Face Bulb Angle	44 × ·46 9 × 3½ × ·60	46 × ·46 9 × 3½ × ·58	47 × ·46 9 × 3½ × ·60			
34	Plate Face Bulb Angle or Double Angle	44 × ·46 9 × 3½ × ·62	46 × ·46 9 × 3½ × ·60	47 × ·46 9 × 3½ × ·64	49 × ·46 9 × 3½ × ·64	50 × ·48 5 × 4 × ·52	51 × 48 5 × 4 × 54.
36	Plate Double Face Angle		4 × 48 5 × 4 × 48	48 × ·48 5 × 4 × ·50	49 × ·48 5 × 4 × ·52	51 × ·48 5 × 4 × ·52	52 × ·48 5 × 4 × ·54
38	Plate Double Face Angle			49 × 48 5 × 4 × 50	50 × ·48 5 × 4 × ·52	52 × ·48 5 × 4 × ·52	52 × ·48 5 × 4 × ·56
40	Plate Double Face Angle					52 × ·48 6 × 4 × ·50	53 × ·48 6 × 4 × ·52
42	Plate Double Face Angle						54 × ·50 6 × 4 × ·52

DEPTH. D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET.					
		66	68	70	72	74	76
Feet. 36	Plate Double Face Angle	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
38	Plate Double Face Angle	54 × ·48 6 × 4 × ·52	55 × ·50 6 × 4 × ·54				
40	Plate Double Face Angle	55 × ·50 6 × 4 × ·52	56 × ·50 6 × 4 × ·54	58 × ·50 6 × 4 × ·54			
42	Plate Double Face Angle	55 × ·50 6 × 4 × ·54	57 × ·50 6 × 4 × ·54	59 × ·50 6 × 4 × ·54	60 × ·50 6 × 4 × ·56		
44	Plate Double Face Angle	56 × ·50 6 × 4 × ·54	58 × ·50 6 × 4 × ·54	60 × ·50 6 × 4 × ·54	61 × ·50 6 × 4 × ·56	62 × ·50 6 × 4 × ·58	
46	Plate Double Face Angle	57 × ·50 6 × 4 × ·54	59 × ·50 6 × 4 × ·54	61 × ·50 6 × 4 × ·54	62 × ·50 6 × 4 × ·56	63 × ·50 6 × 4 × ·58	64 × ·50 6 × 4 × ·60

BOTTOM TRANSVERSES.

SPACING OF TRANSVERSES 12 FEET.

TABLE 1

(See Continuation.)

DEPTH D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET.					
		30	32	34	36	38	40
Feet. 16	Plate	Inches. 28 × ·36	Inches. 28 × ·36	Inches. 29 × ·38	Inches.	Inches.	Inches.
	Face Angle	4 × 3½ × ·48	5 × 4 × ·54	6 × 4 × ·54			
18	Plate		29 × ·38	30 × ·38	31 × ·38	32 × ·40	
	Face Angle or Bulb Angle		5 × 4 × ·56	6 × 4 × ·58	6 × 4 × ·62	7 × 3½ × ·60	
20	Plate			31 × ·40	32 × ·40	33 × ·40	34 × ·42
	Face Angle or Bulb Angle			6 × 4 × ·56	6 × 4 × ·60	7 × 3½ × ·58	8 × 3½ × ·54
22	Plate				32 × ·40	33 × ·40	35 × ·42
	Face Angle or Bulb Angle				6 × 4 × ·62	7 × 3½ × ·60	8 × 3½ × ·52
24	Plate						35 × ·42
	Face Bulb Angle						8 × 3½ × ·54
26	Plate						
	Face Bulb Angle						
28	Plate						
	Face Bulb Angle						

DEPTH D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET.					
		42	44	46	48	50	52
Feet. 22	Plate	Inches. 36 × ·42	Inches. 37 × ·42	Inches.	Inches.	Inches.	Inches.
	Face Bulb Angle	8 × 3½ × ·56	8 × 3½ × ·64				
24	Plate	37 × ·44	38 × ·44	39 × ·44			
	Face Bulb Angle	8 × 3½ × ·54	8 × 3½ × ·58	9 × 3½ × ·58			
26	Plate	37 × ·44	39 × ·44	40 × ·44	41 × ·46	42 × ·46	
	Face Bulb Angle	8 × 3½ × ·56	8 × 3½ × ·56	9 × 3½ × ·56	9 × 3½ × ·60	9 × 3½ × ·66	
28	Plate			41 × ·46	42 × ·46	43 × ·46	44 × ·46
	Face Bulb Angle or Double Angle			9 × 3½ × ·56	9 × 3½ × ·60	9 × 3½ × ·64	5 × 4 × ·52
30	Plate				42 × ·46	44 × ·46	45 × ·46
	Face Bulb Angle or Double Angle				9 × 3½ × ·64	9 × 3½ × ·64	5 × 4 × ·52
32	Plate						45 × ·46
	Double Face Angle						6 × 4 × ·50

BOTTOM TRANSVERSES.

SPACING OF TRANSVERSES 12 FEET.

TABLE 1 *(Concluded.)*

DEPTH D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET.					
		54	56	58	60	62	64
Feet. 30	Plate	Inches. 46 × ·46	Inches. 47 × ·46	Inches. 48 × 46	Inches. 49 × 46.	Inches.	Inches.
	Double Face Angle	6 × 4 × ·50	6 × 4 × ·52	6 × 4 × 52.	6 × 4 × 54		
32	Plate	46 × ·46	48 × ·46	49 × ·46	50 × 48		
	Double Face Angle	6 × 4 × ·52	6 × 4 × ·50	6 × 4 × ·52	6 × 4 × 54.		
34	Plate	47 × ·46	48 × ·46	49 × ·46	50 × ·48	52 × ·48	
	Double Face Angle	6 × 4 × ·50	6 × 4 × ·52	6 × 4 × ·54	6 × 4 × ·56	6 × 4 × ·56	
36	Plate			50 × ·48	51 × ·48	53 × ·48	55 × ·50
	Double Face Angle			6 × 4 × ·52	6 × 4 × ·56	6 × 4 × ·58	6 × 4 × ·58
38	Plate			51 × 48	52 × ·48	54 × ·48	56 × ·50
	Double Face Angle			6 × 4 × 52.	6 × 4 × ·56	6 × 4 × ·58	6 × 4 × ·58
40	Plate						57 × ·50
	Double Face Angle						6 × 4 × ·58
42	Plate						58 × ·50
	Double Face Angle						6 × 4 × ·58

DEPTH D	PLATE AND FACE BAR.	MOULDED BREADTH B OF VESSEL IN FEET.					
		66	68	70	72	74	76
Feet. 36	Plate	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
	Double Face Angle						
38	Plate	57 × ·50	59 × ·50	61 × 50.			
	Double Face Angle	6 × 4 × ·60	6 × 4 × ·60	6 × 4 × 62.			
40	Plate	58 × ·50	60 × ·50	62 × ·50			
	Double Face Angle	6 × 4 × ·60	6 × 4 × ·60	6 × 4 × ·62			
42	Plate	59 × ·50	61 × ·50	63 × ·50	65 × ·50		
	Double Face Angle	6 × 4 × ·62	6 × 4 × ·62	6 × 4 × ·62	6 × 4 × ·62		
44	Plate	60 × ·50	62 × ·50	64 × ·50	66 × ·50	68 × ·50	
	Double Face Angle	6 × 4 × ·62	6 × 4 × ·62	6 × 4 × ·62	6 × 4 × ·62	6 × 4 × ·62	
46	Plate	61 × ·50	63 × ·50	65 × ·50	67 × ·50	69 × ·50	71 × ·50
	Double Face Angle	6 × 4 × ·62	6 × 4 × ·62	6 × 4 × ·62	6 × 4 × ·62	6 × 4 × ·62	6 × 4 × ·62

SIDE TRANSVERSES BELOW SECOND DECK.

SPACING OF TRANSVERSES 8 FEET.

TABLE 2

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	DEPTH (d) IN FEET AT MIDDLE OF LENGTH FROM TOP OF BOTTOM TRANSVERSES AT CENTRE TO LOWEST DECK AT SIDE.								
		7	8	9	10	11	12	13	14	15
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
15	Plate	14 × ·36	14 × ·36							
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36							
16	Plate	14 × ·36	14 × ·36							
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36							
17	Plate	14 × ·36	14 × ·36	15 × ·36						
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36						
18	Plate		14 × ·36	15 × ·36	16 × ·36					
	Face Angle ..		3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36					
19	Plate		15 × ·36	15 × ·36	16 × ·36					
	Face Angle ..		3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36					
20	Plate			15 × ·38	16 × ·38	16 × ·38				
	Face Angle ..			3 × 3 × ·38	3 × 3 × ·38	$3\frac{1}{2} \times 3\frac{1}{2} \times ·38$				
21	Plate			16 × ·38	17 × ·38	17 × ·38	18 × ·38			
	Face Angle ..			3 × 3 × ·38	3 × 3 × ·38	$3\frac{1}{2} \times 3\frac{1}{2} \times ·40$	$4 \times 3\frac{1}{2} \times ·38$			
22	Plate				17 × ·38	18 × ·38	18 × ·38	19 × ·38		
	Face Angle ..				$3\frac{1}{2} \times 3\frac{1}{2} \times ·38$	$3\frac{1}{2} \times 3\frac{1}{2} \times ·40$	$4 \times 3\frac{1}{2} \times ·40$	$4 \times 3\frac{1}{2} \times ·40$		
23	Plate					18 × ·40	19 × ·40	20 × ·40		
	Face Angle ..					$3\frac{1}{2} \times 3\frac{1}{2} \times ·40$	$4 \times 3\frac{1}{2} \times ·40$	$4 \times 3\frac{1}{2} \times ·40$		
24	Plate						20 × ·40	20 × ·42	21 × ·42	
	Face Angle ..						$4 \times 3\frac{1}{2} \times ·40$	$4 \times 3\frac{1}{2} \times ·42$	$4 \times 3\frac{1}{2} \times ·42$	
25	Plate						20 × ·42	21 × ·42	22 × ·42	23 × ·42
	Face Angle ..						$4 \times 3\frac{1}{2} \times ·42$	$4 \times 3\frac{1}{2} \times ·42$	$4 \times 3\frac{1}{2} \times ·42$	$4 \times 3\frac{1}{2} \times ·42$
26	Plate							22 × ·42	23 × ·42	24 × ·42
	Face Angle ..							$4 \times 3\frac{1}{2} \times ·42$	$4 \times 3\frac{1}{2} \times ·42$	$4 \times 3\frac{1}{2} \times ·42$
27	Plate								23 × ·42	24 × ·42
	Face Angle ..								$4 \times 3\frac{1}{2} \times ·44$	$4 \times 3\frac{1}{2} \times ·44$
28	Plate									25 × ·44
	Face Angle ..									$4 \times 3\frac{1}{2} \times ·44$

SIDE TRANSVERSES BELOW SECOND DECK.

SPACING OF TRANSVERSES 8 FEET.

TABLE 2

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	DEPTH (d) IN FEET AT MIDDLE OF LENGTH FROM TOP OF BOTTOM TRANSVERSES AT CENTRE TO LOWEST DECK AT SIDE.								
		16	17	18	19	20	21	22	23	24
Feet. 26	Plate	Inches. 24 × ·42	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
	Face Angle ..	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$								
27	Plate	25 × ·44	25 × ·44							
	Face Angle ..	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$							
28	Plate	25 × ·44	25 × ·44	26 × ·46						
	Face Angle ..	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	5 × $3\frac{1}{2} \times \cdot 50$	5 × $3\frac{1}{2} \times \cdot 50$						
29	Plate	26 × ·44	26 × ·46	27 × ·46	27 × ·46	28 = 46	29 × 46	30 = 46		
	Face Angle ..	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	5 × $3\frac{1}{2} \times \cdot 50$	5 × $3\frac{1}{2} \times \cdot 50$	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$5\frac{1}{2} = 3\frac{1}{2} = 52$	6 = $3\frac{1}{2}$ = 52, 4·64	6 = $3\frac{1}{2}$ = 54 4·84		
30	Plate		26 × ·46	27 × ·46	28 × ·46	29 × ·46	29 = 46	30 = 46		
	Face Angle ..		5 × $3\frac{1}{2} \times \cdot 52$	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$5\frac{1}{2} \times 3\frac{1}{2} \times 52$	6 × $3\frac{1}{2} \times \cdot 52$	6 = $3\frac{1}{2}$ = 54 6·84	6 = $3\frac{1}{2}$ = 54 4·84		
31	Plate		29 = 46	28 × ·46	29 × ·46	29 × ·46	30 × ·46			
	Face Angle ..			$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 54$			
32	Plate				29 × ·46	30 × ·46	30 × ·46	31 × ·46		
	Face Angle ..				$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	6 × $3\frac{1}{2} \times \cdot 52$	6 × $3\frac{1}{2} \times \cdot 56$	6 × $3\frac{1}{2} \times \cdot 56$		
33	Plate				30 × ·46	30 × ·46	31 × ·46	32 × ·46	33 × ·46	
	Face Angle ..				$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$	6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 54$	
34	Plate					31 × ·46	32 × ·46	32 × ·48	33 × ·48	
	Face Angle ..					6 × $3\frac{1}{2} \times \cdot 52$	6 × $3\frac{1}{2} \times \cdot 52$	6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 54$	
35	Plate					31 × ·46	32 × ·46	33 × ·48	34 × ·48	35 × ·48
	Face Angle ..					6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 52$	6 × $3\frac{1}{2} \times \cdot 56$
36	Plate						33 × ·46	34 × ·48	34 × ·48	35 × ·48
	Face Angle ..						6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 56$	6 × $3\frac{1}{2} \times \cdot 60$
37	Plate							34 × ·48	35 × ·48	36 × ·48
	Face Angle ..							$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$
38	Plate								36 × ·48	36 × ·48
	Face Angle ..								$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$6\frac{1}{2} \times 4 \times \cdot 54$
39	Plate								36 × ·48	37 × ·48
	Face Angle ..								$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$	$6\frac{1}{2} \times 4 \times \cdot 54$
40	Plate									37 × ·48
	Face Angle ..									$6\frac{1}{2} \times 4 \times \cdot 56$

SIDE TRANSVERSES BELOW SECOND DECK.

SPACING OF TRANSVERSES 8 FEET.

TABLE 2

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	DEPTH (d) IN FEET AT MIDDLE OF LENGTH FROM TOP OF BOTTOM TRANSVERSES AT CENTRE TO LOWEST DECK AT SIDE.								
		25	26	27	28	29	30	31	32	33
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
32	Plate									
	Face Angle ..									
33	Plate									
	Face Angle ..									
34	Plate									
	Face Angle ..									
35	Plate									
	Face Angle ..									
36	Plate	36 × ·48								
	Face Angle ..	6 × 3½ × ·60								
37	Plate	36 × ·48								
	Face Angle ..	6½ × 3½ × ·60								
38	Plate	37 × ·48	37 × ·48							
	Face Angle ..	6½ × 3½ × ·58	6½ × 3½ × ·60							
39	Plate	37 × ·48	38 × ·48	39 × ·48						
	Face Angle ..	6½ × 4 × ·58	6½ × 4 × ·58	6½ × 4 × ·58						
40	Plate	38 × ·48	38 × ·48	39 × ·48	40 × ·48					
	Face Angle ..	6½ × 4 × ·56	6½ × 4 × ·60	6½ × 4 × ·60	6½ × 4 × ·60					
41	Plate	38 × ·48	39 × ·48	40 × ·48	41 × ·48	42 × ·48				
	Face Angle ..	6½ × 4 × ·58	6½ × 4 × ·58	6½ × 4 × ·60	6½ × 4 × ·60	6½ × 4 × ·60				
42	Plate		39 × ·50	40 × ·50	41 × ·50	42 × ·50	43 × ·50			
	Face Angle ..		6½ × 4 × ·60	6½ × 4 × ·60	6½ × 4 × ·62	6½ × 4 × ·62	6½ × 4 × ·62			
43	Plate			40 × ·50	41 × ·50	42 × ·50	43 × ·50	44 × ·50		
	Face Angle ..			6½ × 4 × ·64	6½ × 4 × ·64	6½ × 4 × ·64	6½ × 4 × ·64	6½ × 4 × ·64		
44	Plate				42 × ·50	43 × ·50	43 × ·50	44 × ·50	45 × ·50	
	Face Angle ..				6½ × 4 × ·62	6½ × 4 × ·62	6½ × 4 × ·68	6½ × 4 × ·68	6½ × 4 × ·70	
45	Plate					43 × ·50	44 × ·50	45 × ·50	46 × ·50	47 × ·50
	Face Angle ..					6½ × 4 × ·68	6½ × 4 × ·70	6½ × 4 × ·72	6½ × 4 × ·74	6½ × 4 × ·76

SIDE TRANSVERSES BELOW SECOND DECK.

SPACING OF TRANSVERSES 10 FEET.

TABLE 2

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	DEPTH (d) IN FEET AT MIDDLE OF LENGTH FROM TOP OF BOTTOM TRANSVERSES AT CENTRE TO LOWEST DECK AT SIDE.								
		7	8	9	10	11	12	13	14	15
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
15	Plate	14 × ·36	14 × ·36							
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36							
16	Plate	14 × ·36	14 × ·36							
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36							
17	Plate	14 × ·36	15 × ·36	16 × ·36						
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36						
18	Plate		15 × ·36	16 × ·38	17 × ·38					
	Face Angle ..		3 × 3 × ·36	3 × 3 × ·38	3 × 3 × ·38					
19	Plate		16 × ·38	17 × ·38	18 × ·38					
	Face Angle ..		3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38					
20	Plate			17 × ·38	18 × ·38	18 × ·38				
	Face Angle ..			3 × 3 × ·42	3½ × 3½ × ·38	4 × 3½ × ·38				
21	Plate			18 × ·38	19 × ·38	19 × ·38	20 × ·38			
	Face Angle ..			3 × 3 × ·42	3½ × 3½ × ·38	4 × 3½ × ·38	4½ × 3½ × ·38			
22	Plate				19 × ·38	20 × ·38	20 × ·38	21 × ·40		
	Face Angle ..				3½ × 3½ × ·40	4 × 3½ × ·38	4½ × 3½ × ·40	4½ × 3½ × ·40		
23	Plate					20 × ·40	21 × ·40	22 × ·40		
	Face Angle ..					4 × 3½ × ·40	4½ × 3½ × ·40	4½ × 3½ × ·40		
24	Plate						22 × ·40	22 × ·42	23 × ·42	
	Face Angle ..						4½ × 3½ × ·40	4½ × 3½ × ·42	4½ × 3½ × ·44	
25	Plate						22 × ·42	23 × ·42	24 × ·42	25 × ·44
	Face Angle ..						4½ × 3½ × ·42	4½ × 3½ × ·42	4½ × 3½ × ·42	4½ × 3½ × ·44
26	Plate							24 × ·42	25 × ·42	26 × ·44
	Face Angle ..							4½ × 3½ × ·42	4½ × 3½ × ·42	4½ × 3½ × ·44
27	Plate								25 × ·44	26 × ·44
	Face Angle ..								4½ × 3½ × ·44	5 × 3½ × ·44
28	Plate							25 × 44	26 × NW	27 × ·44
	Face Angle ..							4½ × 3½ × NW	4½ × 3½ × NW	5 × 3½ × ·44

SIDE TRANSVERSES BELOW SECOND DECK.

SPACING OF TRANSVERSES 10 FEET.

TABLE 2

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	DEPTH (d) IN FEET AT MIDDLE OF LENGTH FROM TOP OF BOTTOM TRANSVERSES AT CENTRE TO LOWEST DECK AT SIDE.								
		16	17	18	19	20	21	22	23	24
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
26	Plate	26 × ·44								
	Face Angle ..	5 × 3½ × ·44								
27	Plate	27 × ·44	27 × ·44							
	Face Angle ..	5 × 3½ × ·44	5½ × 3½ × ·48							
28	Plate	27 × ·44	27 × ·46	28 × ·46						
	Face Angle ..	5½ × 3½ × ·44	6 × 3½ × ·50	6 × 3½ × ·50						
29	Plate	28 × ·46	28 × ·46	29 × ·46	29 × ·46		31 × ·46	31 × ·46		
	Face Angle ..	5½ × 3½ × ·44	6 × 3½ × ·50	6 × 3½ × ·50	6 × 3½ × ·56		6½ × 3½ × ·54			
30	Plate		28 × ·46	29 × ·46	30 × ·46	31 × ·46				
	Face Angle ..		6 × 3½ × ·52	6 × 3½ × ·52	6 × 3½ × ·54	6½ × 3½ × ·54				
31	Plate			30 × ·46	31 × ·46	31 × ·46	32 × ·46			
	Face Angle ..			6 × 3½ × ·50	6 × 3½ × ·54	6½ × 3½ × ·56	6½ × 4 × ·60			
32	Plate				31 × ·46	32 × ·46	32 × ·46	33 × ·46		
	Face Angle ..				6 × 3½ × ·56	6½ × 4 × ·56	6½ × 4 × ·60	6½ × 4 × ·60		
33	Plate				32 × ·46	32 × ·46	33 × ·46	34 × ·46	35 × ·46	
	Face Angle ..				6 × 3½ × ·54	6½ × 4 × ·58	6½ × 4 × ·60	6½ × 4 × ·60	6½ × 4 × ·64	
34	Plate					33 × ·46	34 × ·46	34 × ·46	35 × ·46	
	Face Angle ..					6½ × 4 × ·56	6½ × 4 × ·60	6½ × 4 × ·60	6½ × 4 × ·64	
35	Plate					33 × ·46	34 × ·46	35 × ·46	36 × ·46	37 × ·46
	Face Angle ..					6½ × 4 × ·56	6½ × 4 × ·60	6½ × 4 × ·62	6½ × 4 × ·62	6½ × 4 × ·62
36	Plate						35 × ·48	36 × ·48	36 × ·48	37 × ·48
	Face Angle ..						6½ × 4 × ·58	6½ × 4 × ·60	6½ × 4 × ·64	6½ × 4 × ·64
37	Plate							36 × ·48	37 × ·48	38 × ·48
	Face Angle ..							6½ × 4 × ·62	6½ × 4 × ·62	6½ × 4 × ·62
38	Plate								38 × ·48	38 × ·48
	Face Angle ..								6½ × 4 × ·62	7 × 4 × ·62
39	Plate								38 × ·48	39 × ·48
	Face Angle ..								6½ × 4 × ·64	7 × 4 × ·62
40	Plate									39 × ·48
	Face Angle ..									7 × 4 × ·64

SIDE TRANSVERSES BELOW SECOND DECK.

SPACING OF TRANSVERSES 10 FEET.

TABLE 2

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	DEPTH (d) IN FEET AT MIDDLE OF LENGTH FROM TOP OF BOTTOM TRANSVERSES AT CENTRE TO LOWEST DECK AT SIDE.								
		25	26	27	28	29	30	31	32	33
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
32	Plate .. .. .. Face Angle ..									
33	Plate .. .. .. Face Angle ..									
34	Plate .. .. .. Face Angle ..									
35	Plate .. .. .. Face Angle ..									
36	Plate .. .. .. Face Angle ..	38 × ·48 $6\frac{1}{2} \times 4 \times ·64$								
37	Plate .. .. .. Face Angle ..	38 × ·48 $6\frac{1}{2} \times 4 \times ·66$								
38	Plate .. .. .. Face Angle ..	39 × ·48 7 × 4 × ·62	39 × ·48 7 × 4 × ·64							
39	Plate .. .. .. Face Angle ..	39 × ·48 7 × 4 × ·64	39 × ·48 7 × 4 × ·66							
40	Plate .. .. .. Face Angle ..	40 × ·48 7 × 4 × ·64	40 × ·48 7 × 4 × ·66	41 × ·48 7 × 4 × ·66	42 × ·48 7 × 4 × ·68					
41	Plate .. .. .. Face Angle ..	40 × ·48 7 × 4 × ·66	41 × ·48 7 × 4 × ·66	42 × ·48 7 × 4 × ·66	43 × ·48 7 × 4 × ·68	44 × ·48 7 × 4 × ·70				
42	Plate .. .. .. Face Angle ..		41 × ·50 7 × 4 × ·68	42 × ·50 7 × 4 × ·68	43 × ·50 7 × 4 × ·70	44 × ·50 7 × 4 × ·70	45 × ·50 7 × 4 × ·72			
43	Plate .. .. .. Face Angle ..			42 × ·50 7 × 4 × ·70	43 × ·50 7 × 4 × ·70	44 × ·50 7 × 4 × ·72	45 × ·50 7 × 4 × ·74	46 × ·50 7 × 4 × ·74		
44	Plate .. .. .. Face Angle ..				44 × ·50 7 × 4 × ·70	45 × ·50 7 × 4 × ·72	45 × ·50 7 × 4 × ·76	46 × ·50 7 × 4 × ·76	47 × ·50 7 × 4 × ·76	
45	Plate .. .. .. Face Angle ..					45 × ·50 7 × 4 × ·74	46 × ·50 7 × 4 × ·76	47 × ·50 7 × 4 × ·76	48 × ·50 7 × 4 × ·76	49 × ·50 7 × 4 × ·78

SIDE TRANSVERSES BELOW SECOND DECK.

SPACING OF TRANSVERSES 12 FEET.

TABLE 2

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	DEPTH (d) IN FEET AT MIDDLE OF LENGTH FROM TOP OF BOTTOM TRANSVERSES AT CENTRE TO LOWEST DECK AT SIDE.								
		7	8	9	10	11	12	13	14	15
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
15	Plate	15 × ·36	15 × ·36							
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36							
16	Plate	15 × ·36	15 × ·36							
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36							
17	Plate	15 × ·38	16 × ·38	17 × ·38						
	Face Angle ..	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38						
18	Plate		16 × ·38	17 × ·38	18 × ·38					
	Face Angle ..		3 × 3 × ·38	3 × 3 × ·40	3 × 3 × ·40					
19	Plate		17 × ·38	18 × ·38	19 × ·38					
	Face Angle ..		3 × 3 × ·38	3 × 3 × ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 38$					
20	Plate			19 × ·38	20 × ·38	20 × ·38				
	Face Angle ..			3 × 3 × ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 38$	$4 \times 3\frac{1}{2} \times \cdot 40$				
21	Plate				21 × ·40	21 × ·40	21 × ·40			
	Face Angle ..				$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 40$	$4 \times 3\frac{1}{2} \times \cdot 40$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$			
22	Plate				21 × ·40	22 × ·40	22 × ·40	23 × ·40		
	Face Angle ..				$3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$4 \times 3\frac{1}{2} \times \cdot 40$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$		
23	Plate					22 × ·42	23 × ·42	24 × ·42		
	Face Angle ..					$4 \times 3\frac{1}{2} \times \cdot 40$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$	$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 42$		
24	Plate						24 × ·42	24 × ·44	25 × ·44	
	Face Angle ..						$4\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$	5 × $3\frac{1}{2}$ × ·44	5 × $3\frac{1}{2}$ × ·44	
25	Plate						24 × ·44	25 × ·44	26 × ·44	27 × ·44
	Face Angle ..						5 × $3\frac{1}{2}$ × ·42	5 × $3\frac{1}{2}$ × ·44	5 × $3\frac{1}{2}$ × ·44	5 × $3\frac{1}{2}$ × ·44
26	Plate							26 × ·44	27 × ·46	28 × ·46
	Face Angle ..							5 × $3\frac{1}{2}$ × ·44	5 × $3\frac{1}{2}$ × ·46	5 × $3\frac{1}{2}$ × ·46
27	Plate								27 × ·46	28 × ·46
	Face Angle ..								5 × $3\frac{1}{2}$ × ·48	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$
28	Plate									29 × ·46
	Face Angle ..									$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$

SIDE TRANSVERSES BELOW SECOND DECK.

SPACING OF TRANSVERSES 12 FEET.

TABLE 2

(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	DEPTH (d) IN FEET AT MIDDLE OF LENGTH FROM TOP OF BOTTOM TRANSVERSES AT CENTRE TO LOWEST DECK AT SIDE.								
		16	17	18	19	20	21	22	23	24
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
26	Plate	28 × ·46								
	Face Angle ..	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$								
27	Plate	29 × ·46	29 × ·46							
	Face Angle ..	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	6 × $3\frac{1}{2} \times \cdot 50$							
28	Plate	29 × ·46	29 × ·46	30 × ·46						
	Face Angle ..	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$	6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 54$						
29	Plate	30 × ·46	30 × ·46	31 × ·46	31 × ·46					
	Face Angle ..	$5\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$	6 × $3\frac{1}{2} \times \cdot 54$	6 × $3\frac{1}{2} \times \cdot 54$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$					
30	Plate		30 × ·46	31 × ·46	32 × ·46	33 × ·46	33 × ·46			
	Face Angle ..		$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$	$6\frac{1}{2} \times 4 \times \cdot 56$	7 × 4 × ·62			
31	Plate			32 × ·46	33 × ·46	33 × ·46	34 × ·46	35 × ·46		
	Face Angle ..			$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$	$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$	$6\frac{1}{2} \times 4 \times \cdot 58$	7 × 4 × ·62	7 × 4 × ·62		
32	Plate				33 × ·46	34 × ·46	34 × ·46	35 × ·46		
	Face Angle ..				$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$	$6\frac{1}{2} \times 4 \times \cdot 58$	7 × 4 × ·64	7 × 4 × ·66		
33	Plate				34 × ·46	34 × ·46	35 × ·46	36 × ·46	37 × ·46	
	Face Angle ..				$6\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$	$6\frac{1}{2} \times 4 \times \cdot 60$	7 × 4 × ·62	7 × 4 × ·64	7 × 4 × ·64	
34	Plate					35 × ·46	36 × ·46	36 × ·48	37 × ·48	
	Face Angle ..					$6\frac{1}{2} \times 4 \times \cdot 60$	7 × 4 × ·62	7 × 4 × ·64	7 × 4 × ·64	
35	Plate					35 × ·48	36 × ·48	37 × ·48	38 × ·48	39 × ·48
	Face Angle ..					$6\frac{1}{2} \times 4 \times \cdot 60$	6 × 4 × ·62	7 × 4 × ·62	7 × 4 × ·62	7 × 4 × ·66
36	Plate					36 × ·48	37 × ·48	38 × ·48	38 × ·48	39 × ·48
	Face Angle ..					$6\frac{1}{2} \times 4 \times \cdot 60$	7 × 4 × ·60	7 × 4 × ·60	7 × 4 × ·64	7 × 4 × ·68
37	Plate							38 × ·48	39 × ·48	40 × ·48
	Face Angle ..							7 × 4 × ·62	7 × 4 × ·64	7 × 4 × ·66
38	Plate								40 × ·48	40 × ·48
	Face Angle ..								7 × 4 × ·62	7 × 4 × ·64
39	Plate								40 × ·48	41 × ·48
	Face Angle ..								7 × 4 × ·64	7 × 4 × ·68
40	Plate									41 × ·48
	Face Angle ..									7 × 4 × ·70

SIDE TRANSVERSES BELOW SECOND DECK.

SPACING OF TRANSVERSES 12 FEET.

TABLE 2 *(Concluded.)*

DEPTH. D	PLATE AND FACE BAR.	DEPTH (d) IN FEET AT MIDDLE OF LENGTH FROM TOP OF BOTTOM TRANSVERSES AT CENTRE TO LOWEST DECK AT SIDE.								
		25	26	27	28	29	30	31	32	33
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
32	Plate									
	Face Angle									
33	Plate									
	Face Angle									
34	Plate									
	Face Angle									
35	Plate									
	Face Angle									
36	Plate	40 × ·48								
	Face Angle	7 × 4 × ·68								
37	Plate	40 × ·48								
	Face Angle	7 × 4 × ·70								
38	Plate	41 × ·48	41 × ·48							
	Face Angle	7 × 4 × ·70	7 × 4 × ·72							
39	Plate	41 × ·48	41 × ·48							
	Face Angle	7 × 4 × ·72	7 × 4 × ·74							
40	Plate	42 × ·48	42 × ·48	43 × ·48	44 × ·48					
	Face Angle	7 × 4 × ·70	7 × 4 × ·74	7 × 4 × ·74	7 × 4 × ·76					
41	Plate	42 × ·50	43 × ·50	44 × ·50	45 × ·50	45 × ·50				
	Face Angle	7 × 4 × ·70	7 × 4 × ·72	7 × 4 × ·74	7 × 4 × ·76	7 × 4 × ·78				
42	Plate		43 × ·50	44 × ·50	45 × ·50	46 × ·50	47 × ·50			
	Double Face Angles		5 × 3½ × ·50	5 × 3½ × ·50	5 × 3½ × ·52	5 × 3½ × ·52	5 × 3½ × ·52			
43	Plate			44 × ·50	45 × ·50	46 × ·50	47 × ·50	47 × ·50		
	Double Face Angles			5 × 3½ × ·52	5 × 3½ × ·54	5 × 3½ × ·54	5½ × 3½ × ·54	5½ × 3½ × ·56		
44	Plate					47 × ·50	47 × ·50	48 × ·50	49 × ·50	
	Double Face Angles					5 × 3½ × ·54	5½ × 3½ × ·54	5½ × 3½ × ·56	5½ × 3½ × ·58	
45	Plate					47 × ·50	48 × ·50	49 × ·50	50 × ·50	51 × ·50
	Double Face Angles					5 × 3½ × ·56	5½ × 3½ × ·54	5½ × 3½ × ·56	5½ × 3½ × ·58	6 × 3½ × ·58

TABLE 3

STIFFENING ANGLES to TRANSVERSES.

DEPTH OF BOTTOM TRANSVERSE.	STIFFENING ANGLES.
Inches.	Inches.
Not exceeding 30	5 × 3 × ·36
,, 36	6 × 3 × ·38
,, 40	6 × 3½ × ·40
44 and above.	6 × 3½ × ·44

DEPTH OF SIDE TRANSVERSE.	SHORT STIFFENING ANGLES.	LONG STIFFENING ANGLES.
Inches.	Inches.	Inches.
Not exceeding 18	3 × 3 × ·36	5 × 3 × ·36
,, 24	3 × 3 × ·38	6 × 3 × ·38
,, 28	3½ × 3½ × ·40	6 × 3½ × ·40
32 and above.	3½ × 3½ × ·44	6 × 3½ × ·44

LLOYD'S REGISTER OF SHIPPING, LONDON.—*5th March*, 1925.

SIDE TRANSVERSES in 'TWEEN DECKS.

TABLE 4

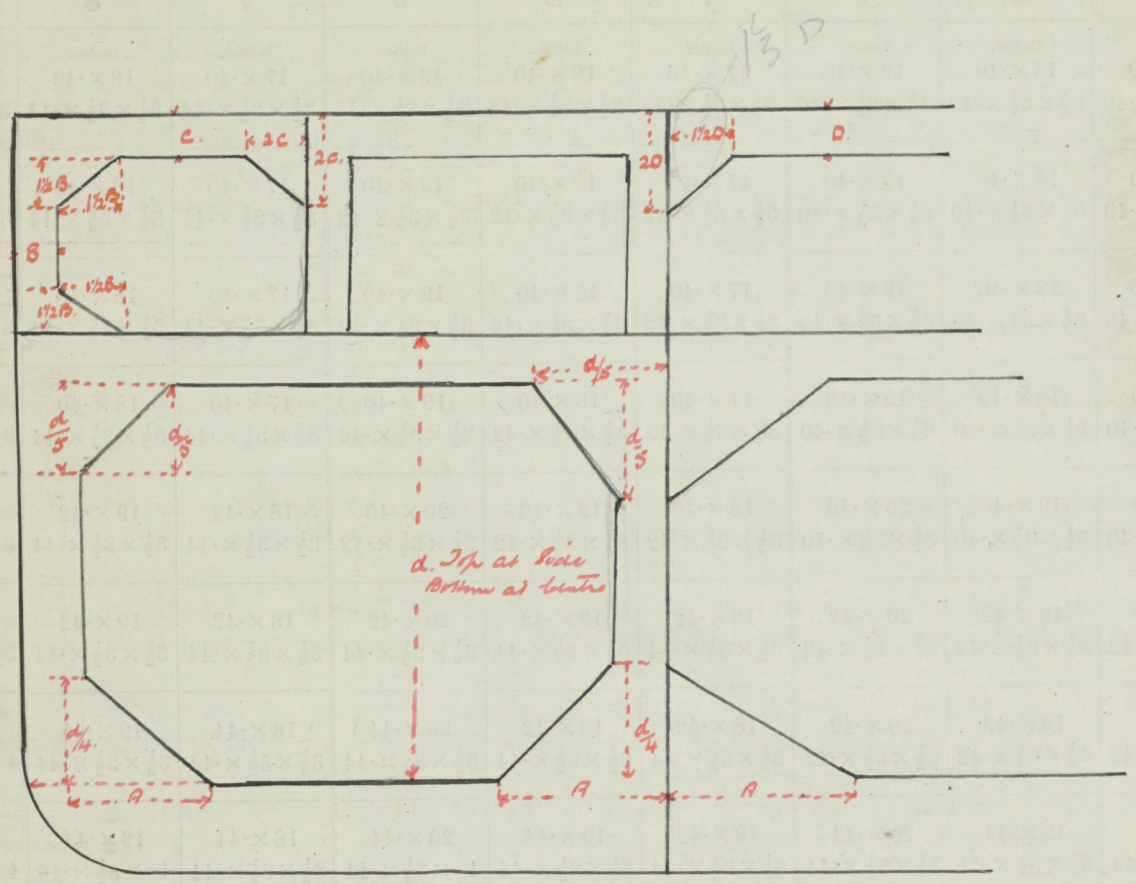
(See Continuation.)

DEPTH. D	PLATE AND FACE BAR.	SPACING OF TRANSVERSES.								
		Feet. 8			Feet. 10			Feet. 12		
		HEIGHT OF 'TWEEN DECKS.								
		Feet. 7	Feet. 8	Feet. 9	Feet. 7	Feet. 8	Feet. 9	Feet. 7	Feet. 8	Feet. 9
Feet. 15	Plate	Inches. 13 × ·36	Inches. 13 × ·36	Inches. 13 × ·36	Inches. 14 × ·36	Inches. 14 × ·36	Inches. 14 × ·36	Inches. 14 × ·36	Inches. 14 × ·36	Inches. 14 × ·36
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36
16	Plate	13 × ·36	13 × ·36	13 × ·36	14 × ·36	14 × ·36	14 × ·36	14 × ·36	14 × ·36	14 × ·36
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36
17	Plate	13 × ·36	13 × ·36	13 × ·36	14 × ·36	14 × ·36	14 × ·36	14 × ·38	14 × ·38	14 × ·38
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38
18	Plate	13 × ·36	13 × ·36	13 × ·36	14 × ·38	14 × ·38	14 × ·38	14 × ·38	14 × ·38	14 × ·38
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38
19	Plate	14 × ·36	14 × ·36	14 × ·36	14 × ·38	14 × ·38	14 × ·38	14 × ·38	14 × ·38	14 × ·38
	Face Angle ..	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38
20	Plate	14 × ·38	14 × ·38	14 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38
	Face Angle ..	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38
21	Plate	14 × ·38	14 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38
	Face Angle ..	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38
22	Plate	14 × ·38	14 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38	15 × ·38
	Face Angle ..	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38	3 × 3 × ·38
23	Plate	14 × ·38	15 × ·38	16 × ·38	15 × ·38	16 × ·38	16 × ·38	15 × ·38	16 × ·38	16 × ·38
	Face Angle ..	3½ × 3½ × ·38	3½ × 3½ × ·38	3½ × 3½ × ·38	3½ × 3½ × ·38	3½ × 3½ × ·38	3½ × 3½ × ·38	3½ × 3½ × ·38	3½ × 3½ × ·38	3½ × 3½ × ·38
24	Plate	15 × ·38	16 × ·38	17 × ·38	15 × ·38	16 × ·38	17 × ·38	15 × ·38	16 × ·38	17 × ·38
	Face Angle ..	3½ × 3½ × ·38	3½ × 3½ × ·38	3½ × 3½ × ·40	3½ × 3½ × ·38	3½ × 3½ × ·38	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40
25	Plate	16 × ·38	17 × ·38	18 × ·38	16 × ·38	17 × ·38	18 × ·38	16 × ·40	17 × ·40	18 × ·40
	Face Angle ..	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40
26	Plate	16 × ·38	17 × ·40	19 × ·40	16 × ·38	17 × ·40	19 × ·40	16 × ·40	17 × ·40	19 × ·40
	Face Angle ..	3½ × 3½ × ·38	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·42	3½ × 3½ × ·42
27	Plate	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40
	Face Angle ..	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42
28	Plate	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40
	Face Angle ..	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42
29	Plate	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40
	Face Angle ..	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42
30	Plate	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40
	Face Angle ..	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·40	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42	3½ × 3½ × ·42

SIDE TRANSVERSES in 'TWEEN DECKS.

TABLE 4 *(Concluded.)*

DEPTH. D	PLATE AND FACE BAR.	SPACING OF TRANSVERSES.								
		Feet. 8			Feet. 10			Feet. 12		
		HEIGHT OF 'TWEEN DECKS.								
		Feet. 7	Feet. 8	Feet. 9	Feet. 7	Feet. 8	Feet. 9	Feet. 7	Feet. 8	Feet. 9
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
31	Plate	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40
	Face Angle ..	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ 40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44
32	Plate	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40
	Face Angle ..	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44
33	Plate	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40
	Face Angle ..	$3\frac{1}{2} \times 3\frac{1}{2} \times$ 40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44
34	Plate	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40	17 × ·40	18 × ·40	19 × ·40
	Face Angle ..	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44
35	Plate	18 × ·40	19 × ·40	20 × ·40	18 × ·40	19 × ·40	20 × ·40	18 × ·42	19 × ·42	20 × ·42
	Face Angle ..	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44
36	Plate	18 × ·42	19 × ·42	20 × ·42	18 × ·42	19 × ·42	20 × ·42	18 × ·42	19 × ·42	20 × ·42
	Face Angle ..	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44
37	Plate	18 × ·42	19 × ·42	20 × ·42	18 × ·42	19 × ·42	20 × ·44	18 × ·44	19 × ·44	20 × ·44
	Face Angle ..	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·44
38	Plate	18 × ·44	19 × ·44	20 × ·44	18 × ·42	19 × ·44	20 × ·44	18 × ·44	19 × ·44	20 × ·44
	Face Angle ..	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·46	4 × $3\frac{1}{2} \times$ ·46
39	Plate	18 × ·44	19 × ·44	20 × ·44	18 × ·44	19 × ·44	20 × ·44	18 × ·44	19 × ·44	20 × ·44
	Face Angle ..	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·46	4 × $3\frac{1}{2} \times$ ·46	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·46	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·46
40	Plate	18 × ·44	19 × ·44	20 × ·44	19 × ·44	20 × ·44	21 × ·44	19 × ·44	20 × ·44	21 × ·44
	Face Angle ..	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·46	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·46	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·46	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·46	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·48
41	Plate	18 × ·44	19 × ·44	20 × ·44	19 × ·44	20 × ·44	21 × ·44	19 × ·44	20 × ·44	21 × ·44
	Face Angle ..	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·46	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·46	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·46	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·46	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·48
42	Plate	18 × ·44	19 × ·44	20 × ·44	19 × ·44	20 × ·44	21 × ·44	19 × ·44	20 × ·44	21 × ·44
	Face Angle ..	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·46	4 × $3\frac{1}{2} \times$ ·44	4 × $3\frac{1}{2} \times$ ·46	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·46	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·46	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·48
43	Plate	18 × ·44	19 × ·44	20 × ·44	19 × ·44	20 × ·44	21 × ·44	20 × ·44	21 × ·44	22 × ·44
	Face Angle ..	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·44	5 × $3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·48
44	Plate	18 × ·44	19 × ·44	20 × ·44	19 × ·44	20 × ·44	21 × ·44	20 × ·44	21 × ·44	22 × ·44
	Face Angle ..	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·44	5 × $3\frac{1}{2} \times$ ·44	5 × $3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·48
45	Plate	18 × ·44	19 × ·44	20 × ·44	19 × ·44	20 × ·44	21 × ·44	20 × ·44	21 × ·44	22 × ·44
	Face Angle ..	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	$4\frac{1}{2} \times 3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·44	5 × $3\frac{1}{2} \times$ ·44	5 × $3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·46	5 × $3\frac{1}{2} \times$ ·48



Lightening holes.

Bottom transverse 10"
Side " hold 6"
Deck " 4"
Bulkhead with holes 6"

UPPER DECK TRANSVERSES.

TRANSVERSES IN SUMMER TANKS. TABLE 5

BREADTH OF SHIP. B.	PLATE AND FACE BAR.	SPACING OF TRANSVERSES. Feet. 8	Feet. 10	Feet. 12
Feet.		Inches.	Inches.	Inches.
30	Plate	10 × ·36	10 × ·38	11 × ·38
	Face Bar	3 × 3 × ·36	3 × 3 × ·38	$3\frac{1}{2} \times 3\frac{1}{2} \times ·40$
40	Plate	11 × ·38	11 × ·38	11 × ·40
	Face Bar	3 × 3 × ·38	$3\frac{1}{2} \times 3\frac{1}{2} \times ·38$	4 × $3\frac{1}{2}$ × ·40
50	Plate	11 × ·40	11 × ·40	12 × ·40
	Face Bar	$3\frac{1}{2} \times 3\frac{1}{2} \times ·40$	4 × $3\frac{1}{2}$ × ·40	$4\frac{1}{2} \times 3\frac{1}{2} \times ·40$
60	Plate	12 × ·40	12 × ·40	13 × ·40
	Face Bar	4 × $3\frac{1}{2}$ × ·40	$4\frac{1}{2} \times 3\frac{1}{2} \times ·40$	$5\frac{1}{2} \times 3\frac{1}{2} \times ·40$
70	Plate	13 × ·40	14 × ·40	15 × ·40
	Face Bar	5 × $3\frac{1}{2}$ × ·40	$5\frac{1}{2} \times 3\frac{1}{2} \times ·46$	6 × $3\frac{1}{2}$ × ·50

TRANSVERSES IN EXPANSION TRUNK. TABLE 6

BREADTH OF SHIP. B.	PLATE AND FACE BAR.	SPACING OF TRANSVERSES. Feet. 8	Feet. 10	Feet. 12
Feet.		Inches.	Inches.	Inches.
30	Plate	10 × ·36	12 × ·36	14 × ·36
	Breadth of Flange ..	5	5	5
40	Plate	14 × ·36	15 × ·40	16 × ·40
	Breadth of Flange ..	5	5	5
50	Plate	16 × ·40	17 × ·40	18 × ·40
	Breadth of Flange ..	5	5	5
60	Plate	17 × ·40	18 × ·40	19 × ·40
	Breadth of Flange ..	5	5	5
70	Plate	18 × ·40	19 × ·40	20 × ·40
	Breadth of Flange ..	5	5	5

SECOND DECK TRANSVERSES. TABLE 7

BREADTH OF SHIP. B.	PLATE AND FACE BAR.	SPACING OF TRANSVERSES. Feet. 8	Feet. 10	Feet. 12
Feet.		Inches.	Inches.	Inches.
30	Plate	12 × ·38	14 × ·40	16 × ·40
	Face Bar	$3\frac{1}{2} \times 3\frac{1}{2} \times ·44$	$4\frac{1}{2} \times 3\frac{1}{2} \times ·44$	5 × $3\frac{1}{2}$ × ·44
40	Plate	14 × ·40	16 × ·40	18 × ·40
	Face Bar	5 × $3\frac{1}{2}$ × ·50	$5\frac{1}{2} \times 3\frac{1}{2} \times ·50$	6 × $3\frac{1}{2}$ × ·50
50	Plate	16 × ·40	18 × ·40	20 × ·40
	Face Bar	$5\frac{1}{2} \times 3\frac{1}{2} \times ·50$	6 × $3\frac{1}{2}$ × ·50	6 × $3\frac{1}{2}$ × ·60
60	Plate	20 × ·40	22 × ·42	24 × ·42
	Face Bar	6 × $3\frac{1}{2}$ × ·50	6 × $3\frac{1}{2}$ × ·60	6 × $3\frac{1}{2}$ × ·70
70	Plate	24 × ·42	26 × ·44	28 × ·44
	Face Bar	6 × $3\frac{1}{2}$ × ·60	$6\frac{1}{2} \times 3\frac{1}{2} \times ·60$	$6\frac{1}{2} \times 3\frac{1}{2} \times ·70$

BOTTOM LONGITUDINALS where ONE TRANSVERSE in each TANK.

SPACING OF TRANSVERSES 10 FEET.

TABLE 8

(See Continuation.)

FIRST LONGITUDINAL NUMERAL L × D	MOULDED DEPTH D OF VESSEL IN FEET.							
	15	16	17	18	19	20	21	22
3000	Inches. $9 \times 3\frac{1}{2} \times \cdot 50$ 20 20	Inches. $9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 21 85	Inches. $9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 22.30	Inches. $9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 22 75	Inches.	Inches.	Inches.	Inches.
4000		$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 22.75	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 23 20	$10 \times 3\frac{1}{2} \times \cdot 46$ 24 25	$10 \times 3\frac{1}{2} \times \cdot 48$ 24.85	$10 \times 3\frac{1}{2} \times \cdot 52$ 25 80		
5000			$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ 24.05	$10 \times 3\frac{1}{2} \times \cdot 48$ 24 85	$10 \times 3\frac{1}{2} \times \cdot 50$ 25.35	$10 \times 3\frac{1}{2} \times \cdot 54$ 26 30	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 28.00	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 28.50
6000					$10 \times 3\frac{1}{2} \times \cdot 54$ 26 30	$10 \times 3\frac{1}{2} \times \cdot 58$ 27.25	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 28 50	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 29.50
7000							$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 29.50	$11 \times 3\frac{1}{2} \times \cdot 48$ 30.90
8000								
9000								
10000								
11000								

BULB ANGLES

FIRST LONGITUDINAL NUMERAL L × D	MOULDED DEPTH D OF VESSEL IN FEET.							
	23	24	25	26	27	28	29	30
6000	Inches. $10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ 30 00	Inches. $11 \times 3\frac{1}{2} \times \cdot 50$ 31.4	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
7000	$11 \times 3\frac{1}{2} \times \cdot 50$ 31.4	$11 \times 3\frac{1}{2} \times \cdot 54$ 32.40	$11 \times 3\frac{1}{2} \times \cdot 56$ 32.40					
8000	$11 \times 3\frac{1}{2} \times \cdot 54$ 32.40	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 34.10	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 34.70	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 35.30	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 35.90	36.3	36.8	34.3
9000			$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 35.30	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 35.90	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ 36.30	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$ 36.90	34.3	38.4
10000				$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ 36.30	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$ 36.90	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 60$ 37.30	$12 \times 3\frac{1}{2} \times \cdot 54$ 38.90	
11000						$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 64$ 39 30	$12 \times 3\frac{1}{2} \times \cdot 56$ 39 50	$12 \times 3\frac{1}{2} \times \cdot 58$ 40 00
12000							$12 \times 3\frac{1}{2} \times \cdot 60$ 40 60	$12 \times 3\frac{1}{2} \times \cdot 62$ 41.10
13000								$12 \times 3\frac{1}{2} \times \cdot 66$ 42.10
14000								
15000								

BULB ANGLES

BOTTOM LONGITUDINALS where ONE TRANSVERSE in each TANK.

SPACING OF TRANSVERSES 10 FEET.

TABLE 8

(See Continuation.)

FIRST LONGITUDINAL NUMERAL L × D		MOULDED DEPTH D OF VESSEL IN FEET.						
		31	32	33	34	35	36	37
11000	BULB ANGLES	Inches. $12\times3\frac{1}{2}\times\cdot60$ 40·60	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
12000	BULB ANGLES	$12\times3\frac{1}{2}\times\cdot64$ 41·60	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 43·00	44·6	45·4		47·6	
13000	CHANNELS	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot50$ 43·00	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot54$ 44·60	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 45·40	46·2	47·6	48·5	49·3
14000	CHANNELS	44·6	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot56$ 45·40	$12\times3\frac{1}{2}\times3\frac{1}{2}\times\cdot58$ 46·20	$12\times4\times4\times\cdot52$ 47·60	48·5	49·3	
15000	CHANNELS			$12\times4\times4\times\cdot52$ 47·60	$12\times4\times4\times\cdot54$ 48·50	$12\times4\times4\times\cdot56$ 49·30		
16000	CHANNELS				$12\times4\times4\times\cdot56$ 49·30	$12\times4\times4\times\cdot58$ 50·10	$13\times4\times4\times\cdot50$ 52·60	
17000	CHANNELS				52·6	$13\times4\times4\times\cdot52$ 53·60	$13\times4\times4\times\cdot54$ 54·50	$13\times4\times4\times\cdot56$ 55·50
18000	CHANNELS						$13\times4\times4\times\cdot56$ 55·50	$13\times4\times4\times\cdot58$ 56·50
19000	CHANNELS							$13\times4\times4\times\cdot62$ 58·50

FIRST LONGITUDINAL NUMERAL L × D		MOULDED DEPTH D OF VESSEL IN FEET.							
		38	39	40	41	42	43	44	45
17000	CHANNELS	Inches. $13\times4\times4\times\cdot58$ 56·50	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
18000	CHANNELS	$13\times4\times4\times\cdot60$ 57·50	$14\times4\times4\times\cdot50$ 58·60						
19000	CHANNELS	$13\times4\times4\times\cdot64$ 59·50	$14\times4\times4\times\cdot54$ 60·80	$14\times4\times4\times\cdot56$ 61·40					
20000	CHANNELS		$14\times4\times4\times\cdot56$ 61·90	$14\times4\times4\times\cdot58$ 63·00	$15\times4\times4\times\cdot52$ 65·40				
21000	CHANNELS		63·9	$14\times4\times4\times\cdot62$ 65·40	$15\times4\times4\times\cdot56$ 68·00	$15\times4\times4\times\cdot58$ 69·40	71		
22000	CHANNELS		65·4	68·5	$15\times4\times4\times\cdot60$ 71·00	$15\times4\times4\times\cdot62$ 72·30	$15\frac{1}{2}\times\cdot44$ $4\times3\frac{1}{2}\times\cdot44$ 72·9		
23000	CHANNELS					$15\times4\times4\times\cdot66$ 74·80	$16\times\cdot44$ $4\times3\frac{1}{2}\times\cdot44$ 76·3		
24000	PLATE & FACE BAR.						$16\times\cdot44$ $4\times3\frac{1}{2}\times\cdot46$ 78·0	$16\frac{1}{2}\times\cdot44$ $4\times3\frac{1}{2}\times\cdot46$	
25000	PLATE & FACE BAR.						$16\frac{1}{2}\times\cdot44$ $4\times3\frac{1}{2}\times\cdot46$	$17\times\cdot44$ $4\times3\frac{1}{2}\times\cdot46$	$17\times\cdot44$ $4\times3\frac{1}{2}\times\cdot48$
26000	PLATE & FACE BAR.							$17\frac{1}{2}\times\cdot44$ $4\times3\frac{1}{2}\times\cdot46$	$17\frac{1}{2}\times\cdot44$ $4\times3\frac{1}{2}\times\cdot48$

The Scantlings of the Bar connecting the built type of Longitudinal to the Shell are to be the same as the Face Bar but the thickness of the Shell Bar need not exceed ·50 inch.

BOTTOM LONGITUDINALS where ONE TRANSVERSE in each TANK.

SPACING OF TRANSVERSES 12 FEET.

TABLE 8

(See Continuation.)

FIRST LONGITUDINAL NUMERAL L × D		MOULDED DEPTH D OF VESSEL IN FEET.							
		15	16	17	18	19	20	21	22
3000	^ BULB ANGLES	Inches. $11 \times 3\frac{1}{2} \times \cdot 48$ 30.90	Inches. $11 \times 3\frac{1}{2} \times \cdot 56$ 32.40	Inches. $11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 34.10	Inches. $11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 35.30.	Inches.	Inches.	Inches.	Inches.
4000	BULB ANGLES		$11 \times 3\frac{1}{2} \times \cdot 58$ 33.40	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 35.30	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ 36.30	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 60$ 37.30.	$12 \times 3\frac{1}{2} \times \cdot 50$ 37.70.		
5000	BULB ANGLES			$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ 36.30	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 60$ 37.30.	$12 \times 3\frac{1}{2} \times \cdot 50$ 37.70.	$12 \times 3\frac{1}{2} \times \cdot 54$ 38.90	$12 \times 3\frac{1}{2} \times \cdot 56$ 39.50	$12 \times 3\frac{1}{2} \times \cdot 60$ 40.60
6000	BULB ANGLES					$12 \times 3\frac{1}{2} \times \cdot 54$ 38.90	$12 \times 3\frac{1}{2} \times \cdot 58$ 40.00	$12 \times 3\frac{1}{2} \times \cdot 60$ 40.60	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 42.0
7000	v BULB ANGLES							$12 \times 3\frac{1}{2} \times \cdot 64$ 44.60	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 44.60
8000	^ CHANNELS								
9000	CHANNELS								
10000	CHANNELS								
11000	v CHANNELS								

FIRST LONGITUDINAL NUMERAL L × D		MOULDED DEPTH D OF VESSEL IN FEET.						
		23	24	25	26	27	28	29
6000	^ CHANNELS	Inches. $12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 43.00	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
7000	CHANNELS	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 44.60	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ 45.40	$12 \times 4 \times 4 \times \cdot 50$ 46.80				
8000	CHANNELS	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$ 46.20	$12 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \cdot 60$ 47.00	$12 \times 4 \times 4 \times \cdot 54$ 48.50	$12 \times 4 \times 4 \times \cdot 56$ 49.30	50.9	52.6	53.6
9000	CHANNELS		$12 \times 4 \times 4 \times \cdot 54$ 48.50	$12 \times 4 \times 4 \times \cdot 58$ 50.10	$12 \times 4 \times 4 \times \cdot 60$ 50.90	$13 \times 4 \times 4 \times \cdot 50$ 52.60	$13 \times 4 \times 4 \times \cdot 52$ 53.60	54.5
10000	CHANNELS				$12 \times 4 \times 4 \times \cdot 64$ 52.60.	$13 \times 4 \times 4 \times \cdot 52$ 53.60	$13 \times 4 \times 4 \times \cdot 54$ 54.50	$13 \times 4 \times 4 \times \cdot 54$ 54.50
11000	CHANNELS					$13 \times 4 \times 4 \times \cdot 54$ 54.50	$13 \times 4 \times 4 \times \cdot 56$ 55.50	$13 \times 4 \times 4 \times \cdot 58$ 56.50
12000	CHANNELS							$13 \times 4 \times 4 \times \cdot 62$ 58.50
13000	CHANNELS							
14000	CHANNELS							
15000	v CHANNELS							

SIDE LONGITUDINALS where ONE TRANSVERSE is FITTED in EACH TANK.

SPACING OF TRANSVERSES 10 FEET.

TABLE 10

(See Continuation.)

FIRST LONGITUDINAL NUMERAL L × D		IN 'TWEEN DECKS.	DISTANCE, IN FEET, OF LONGITUDINAL BELOW UPPER DECK AT SIDE.						
			10	12	14	16	18	20	22
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3000		6 × 3 × ·34 7·15	6½ × 3 × ·38 8·75	7 × 3 × ·40 10·60					
4000		6 × 3 × ·36 7·30	7 × 3 × ·36 10·10	7 × 3 × ·40 10·60					
5000		6 × 3 × ·38 7·50	7 × 3 × ·38 10·35	7 × 3 × ·42 10·80	7½ × 3 × ·46 13·05				
6000		6½ × 3 × ·36 8·55	7 × 3 × ·40 10·60	7½ × 3 × ·40 12·30	8 × 3 × ·40 14·15	8 × 3 × ·44 14·70			
7000		6½ × 3½ × ·36 8·60	7 × 3½ × ·42 10·85	7½ × 3½ × ·40 12·30	8 × 3½ × ·40 14·15	8½ × 3½ × ·40 16·75	8½ × 3½ × ·42 16·50		
8000		6½ × 3½ × ·38 8·80	7 × 3½ × ·44 11·05	7½ × 3½ × ·42 12·65	8 × 3½ × ·42 14·45	8½ × 3½ × ·40 16·15	8½ × 3½ × ·44 16·95	9 × 3½ × ·40 18·50	
9000		6½ × 3½ × ·38 8·80	7 × 3½ × ·46 11·30	7½ × 3½ × ·44 12·90	8 × 3½ × ·42 14·45	8½ × 3½ × ·42 16·50	8½ × 3½ × ·46 17·20	9 × 3½ × ·42 18·85	9 × 3½ × ·46 19·55
10000		6½ × 3½ × ·40 9·05	7½ × 3½ × ·38 12·05	7½ × 3½ × ·46 13·15	8 × 3½ × ·44 14·75	8½ × 3½ × ·42 16·50	8½ × 3½ × ·46 17·20	9 × 3½ × ·42 18·85	9 × 3½ × ·46 19·55
11000		7 × 3½ × ·40 10·60	7½ × 3½ × ·38 12·05	8 × 3½ × ·40 14·15	8 × 3½ × ·46 15·05	8½ × 3½ × ·44 16·85	9 × 3½ × ·40 18·50	9 × 3½ × ·44 19·20	9 × 3½ × ·48 19·85 19·85
12000		7 × 3½ × ·40 10·60	7½ × 3½ × ·40 12·30	8 × 3½ × ·40 14·15	8 × 3½ × ·46 15·05	8½ × 3½ × ·44 16·85	9 × 3½ × ·40 18·50	9 × 3½ × ·46 19·55	9 × 3½ × ·50 20·20
13000		7 × 3½ × ·42 10·85	7½ × 3½ × ·40 12·30	8 × 3½ × ·42 14·45	8½ × 3½ × ·40 16·15	8½ × 3½ × ·46 17·20	9 × 3½ × ·42 18·85	9 × 3½ × ·46 19·55	9½ × 3½ × ·42 20·85
14000		7 × 3½ × ·42 10·85	7½ × 3½ × ·42 12·65	8 × 3½ × ·42 14·45	8½ × 3½ × ·40 16·15	8½ × 3½ × ·46 17·20	9 × 3½ × ·42 18·85	9 × 3½ × ·48 19·85	9½ × 3½ × ·44 21·35
15000		7 × 3½ × ·42 10·85	7½ × 3½ × ·44 12·90	8 × 3½ × ·44 14·75	8½ × 3½ × ·42 16·50	9 × 3½ × ·40 18·50	9 × 3½ × ·44 19·20	9 × 3½ × ·48 19·85	9½ × 3½ × ·44 21·35
16000		7½ × 3½ × ·40 12·30	7½ × 3½ × ·46 13·15	8 × 3½ × ·44 14·75	8½ × 3½ × ·44 16·85	9 × 3½ × ·40 18·50	9 × 3½ × ·44 19·20	9½ × 3½ × ·42 20·85	9½ × 3½ × ·46 21·95
17000		7½ × 3½ × ·40 12·30	7½ × 3½ × ·46 13·15	8 × 3½ × ·46 15·05	8½ × 3½ × ·44 16·85	9 × 3½ × ·42 18·85	9 × 3½ × ·46 19·55	9½ × 3½ × ·42 20·85	9½ × 3½ × ·46 21·95
18000		7½ × 3½ × ·42 12·65	8 × 3½ × ·40 14·15	8½ × 3½ × ·40 16·15	8½ × 3½ × ·46 17·20	9 × 3½ × ·44 19·20	9½ × 3½ × ·42 20·85	9½ × 3½ × ·44 21·35	9½ × 3½ × ·48 22·30
19000		7½ × 3½ × ·42 12·65	8 × 3½ × ·40 14·15	8½ × 3½ × ·42 16·50	8½ × 3½ × ·48 17·52	9 × 3½ × ·44 19·20	9½ × 3½ × ·42 20·85	9½ × 3½ × ·44 21·35	9½ × 3½ × ·48 22·30
20000		7½ × 3½ × ·44 12·90	8 × 3½ × ·42 14·45	8½ × 3½ × ·44 16·85	8½ × 3½ × ·48 17·52	9 × 3½ × ·46 19·55	9½ × 3½ × ·42 20·85	9½ × 3½ × ·46 21·95	9½ × 3½ × ·50 22·75
21000		8 × 3½ × ·40 14·15	8 × 3½ × ·42 14·45	8½ × 3½ × ·44 16·85	8½ × 3½ × ·50 17·90	9 × 3½ × ·46 19·55	9½ × 3½ × ·44 21·35	9½ × 3½ × ·48 22·30	9½ × 3½ × ·50 22·75
22000		8 × 3½ × ·40 14·15	8 × 3½ × ·44 14·75	8½ × 3½ × ·46 17·20	9 × 3½ × ·42 18·85	9 × 3½ × ·48 19·85	9½ × 3½ × ·44 21·35	9½ × 3½ × ·48 22·30	9½ × 3½ × ·50 22·75
23000		8 × 3½ × ·42 14·45	8 × 3½ × ·44 14·75	8½ × 3½ × ·46 17·20	9 × 3½ × ·42 18·85	9 × 3½ × ·48 19·85	9½ × 3½ × ·44 21·35	9½ × 3½ × ·48 22·30	10 × 3½ × ·44 23·95
24000		8 × 3½ × ·44 14·75	8½ × 3½ × ·44 16·85	8½ × 3½ × ·48 17·52	9 × 3½ × ·44 19·20	9½ × 3½ × ·42 20·85	9½ × 3½ × ·46 21·85	9½ × 3½ × ·50 22·75	10 × 3½ × ·44 23·95
25000		8 × 3½ × ·44 14·75	8½ × 3½ × ·44 16·85	9 × 3½ × ·42 18·85	9 × 3½ × ·46 19·55	9½ × 3½ × ·42 20·85	9½ × 3½ × ·46 21·85	10 × 3½ × ·44 23·85	10 × 3½ × ·46 24·35
26000		8½ × 3½ × ·42 16·80	8½ × 3½ × ·46 17·20	9 × 3½ × ·42 18·83	9 × 3½ × ·46 19·55	9½ × 3½ × ·44 21·35	9½ × 3½ × ·48 21·85	10 × 3½ × ·44 23·85	10 × 3½ × ·46 24·35

BULB ANGLES

SIDE LONGITUDINALS where ONE TRANSVERSE is FITTED in EACH TANK.

TABLE 10

SPACING OF TRANSVERSES 10 FEET.

(See Continuation.)

FIRST LONGITUDINAL NUMERAL L × D	DISTANCE, IN FEET, OF LONGITUDINAL BELOW UPPER DECK AT SIDE.							
	24	26	28	30	32	34	36	38
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3000								
4000								
5000								
6000								
7000								
8000								
9000								
10000								
11000								
12000	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$ 21.35							
13000	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 21.85	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 22.45						
14000	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 22.30	$10 \times 3\frac{1}{2} \times \cdot 44$ 23.85	$10 \times 3\frac{1}{2} \times \cdot 48$ 24.85					
15000	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 22.30	$10 \times 3\frac{1}{2} \times \cdot 44$ 23.85	$10 \times 3\frac{1}{2} \times \cdot 48$ 24.85	$10 \times 3\frac{1}{2} \times \cdot 52$ 25.8				
16000	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 22.45	$10 \times 3\frac{1}{2} \times \cdot 44$ 23.85	$10 \times 3\frac{1}{2} \times \cdot 48$ 24.85	$10 \times 3\frac{1}{2} \times \cdot 52$ 25.9				
17000	$9\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 22.45	$10 \times 3\frac{1}{2} \times \cdot 46$ 24.35	$10 \times 3\frac{1}{2} \times \cdot 50$ 25.35	$10 \times 3\frac{1}{2} \times \cdot 54$ 26.8	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 28.5			
18000	$10 \times 3\frac{1}{2} \times \cdot 44$ 23.85	$10 \times 3\frac{1}{2} \times \cdot 48$ 24.85	$10 \times 3\frac{1}{2} \times \cdot 50$ 25.35	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 24.5	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 28.5			
19000	$10 \times 3\frac{1}{2} \times \cdot 44$ 23.85	$10 \times 3\frac{1}{2} \times \cdot 48$ 24.85	$10 \times 3\frac{1}{2} \times \cdot 50$ 25.35	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 24.5	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 29.0			
20000	$10 \times 3\frac{1}{2} \times \cdot 44$ 23.85	$10 \times 3\frac{1}{2} \times \cdot 48$ 24.85	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$ 24.0	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 24.5	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 52$ 29.0	$11 \times 3\frac{1}{2} \times \cdot 44$ 29.4		
21000	$10 \times 3\frac{1}{2} \times \cdot 46$ 24.35	$10 \times 3\frac{1}{2} \times \cdot 50$ 25.35	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$ 24.0	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 28.0	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 29.5	$11 \times 3\frac{1}{2} \times \cdot 46$ 30.3	$11 \times 3\frac{1}{2} \times \cdot 48$ 30.9	
22000	$10 \times 3\frac{1}{2} \times \cdot 46$ 24.35	$10 \times 3\frac{1}{2} \times \cdot 50$ 25.35	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 44$ 24.0	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 28.0	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 29.5	$11 \times 3\frac{1}{2} \times \cdot 46$ 30.3	$11 \times 3\frac{1}{2} \times \cdot 50$ 31.4	
23000	$10 \times 3\frac{1}{2} \times \cdot 48$ 24.85	$10 \times 3\frac{1}{2} \times \cdot 52$ 25.80	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 24.5	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 28.5	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 29.5	$11 \times 3\frac{1}{2} \times \cdot 48$ 30.9	$11 \times 3\frac{1}{2} \times \cdot 50$ 31.4	
24000	$10 \times 3\frac{1}{2} \times \cdot 48$ 24.85	$10 \times 3\frac{1}{2} \times \cdot 52$ 25.80	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 24.5	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 28.5	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 56$ 30.0	$11 \times 3\frac{1}{2} \times \cdot 48$ 30.9	$11 \times 3\frac{1}{2} \times \cdot 52$ 31.9	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 46$ 33.5
25000	$10 \times 3\frac{1}{2} \times \cdot 50$ 25.35	$10 \times 3\frac{1}{2} \times \cdot 54$ 26.30	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 28.0	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 29.5	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$ 30.5	$11 \times 3\frac{1}{2} \times \cdot 50$ 31.4	$11 \times 3\frac{1}{2} \times \cdot 54$ 32.4	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 34.1
26000	$10 \times 3\frac{1}{2} \times \cdot 50$ 25.35	$10 \times 3\frac{1}{2} \times \cdot 54$ 26.30	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 48$ 28.0	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 54$ 29.5	$10\frac{1}{2} \times 3\frac{1}{2} \times \cdot 58$ 30.5	$11 \times 3\frac{1}{2} \times \cdot 50$ 31.4	$11 \times 3\frac{1}{2} \times \cdot 54$ 32.4	$11\frac{1}{2} \times 3\frac{1}{2} \times \cdot 50$ 34.7

BULB ANGLES

SIDE LONGITUDINALS where ONE TRANSVERSE is FITTED in EACH TANK.

SPACING OF TRANSVERSES 12 FEET.

TABLE 10

(See Continuation.)

FIRST LONGITUDINAL NUMERAL L × D		IN 'TWEEN DECKS.	DISTANCE, IN FEET, OF LONGITUDINAL BELOW UPPER DECK AT SIDE.						
			10	12	14	16	18	20	22
		Inches.	Inches.	Inches	Inches.	Inches.	Inches.	Inches.	Inches.
3000	A	$6\frac{1}{2}\times3\times\cdot34$	$7\frac{1}{2}\times3\times\cdot40$	$8\frac{1}{2}\times3\times\cdot40$					
4000		$7\times3\times\cdot36$	$8\times3\times\cdot42$	$8\frac{1}{2}\times3\times\cdot42$					
5000		$7\times3\times\cdot38$	$8\times3\times\cdot44$	$8\frac{1}{2}\times3\times\cdot44$	$9\times3\frac{1}{2}\times\cdot46$				
6000		$7\frac{1}{2}\times3\times\cdot38$	$8\times3\times\cdot46$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$9\times3\frac{1}{2}\times\cdot48$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot46$			
7000		$7\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$9\times3\frac{1}{2}\times\cdot48$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$10\times3\frac{1}{2}\times\cdot46$		
8000		$7\frac{1}{2}\times3\frac{1}{2}\times\cdot38$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$9\times3\frac{1}{2}\times\cdot42$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$10\times3\frac{1}{2}\times\cdot44$	$10\times3\frac{1}{2}\times\cdot48$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	
9000		$7\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$9\times3\frac{1}{2}\times\cdot44$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$10\times3\frac{1}{2}\times\cdot44$	$10\times3\frac{1}{2}\times\cdot48$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	
10000		$7\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$9\times3\frac{1}{2}\times\cdot46$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$10\times3\frac{1}{2}\times\cdot46$	$10\times3\frac{1}{2}\times\cdot50$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$11\times3\frac{1}{2}\times\cdot46$
11000		$8\times3\frac{1}{2}\times\cdot40$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$9\times3\frac{1}{2}\times\cdot48$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$10\times3\frac{1}{2}\times\cdot46$	$10\times3\frac{1}{2}\times\cdot52$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$11\times3\frac{1}{2}\times\cdot46$
12000		$8\times3\frac{1}{2}\times\cdot40$	$8\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$9\times3\frac{1}{2}\times\cdot48$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$10\times3\frac{1}{2}\times\cdot48$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$11\times3\frac{1}{2}\times\cdot48$
13000		$8\times3\frac{1}{2}\times\cdot42$	$9\times3\frac{1}{2}\times\cdot42$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$10\times3\frac{1}{2}\times\cdot44$	$10\times3\frac{1}{2}\times\cdot50$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$11\times3\frac{1}{2}\times\cdot44$	$11\times3\frac{1}{2}\times\cdot48$
14000		$8\times3\frac{1}{2}\times\cdot42$	$9\times3\frac{1}{2}\times\cdot42$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$10\times3\frac{1}{2}\times\cdot44$	$10\times3\frac{1}{2}\times\cdot50$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$11\times3\frac{1}{2}\times\cdot44$	$11\times3\frac{1}{2}\times\cdot50$
15000		$8\times3\frac{1}{2}\times\cdot42$	$9\times3\frac{1}{2}\times\cdot44$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$10\times3\frac{1}{2}\times\cdot46$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$11\times3\frac{1}{2}\times\cdot46$	$11\times3\frac{1}{2}\times\cdot50$
16000		$8\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$9\times3\frac{1}{2}\times\cdot46$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$10\times3\frac{1}{2}\times\cdot48$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$11\times3\frac{1}{2}\times\cdot46$	$11\times3\frac{1}{2}\times\cdot52$
17000		$8\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$9\times3\frac{1}{2}\times\cdot46$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$10\times3\frac{1}{2}\times\cdot48$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$11\times3\frac{1}{2}\times\cdot48$	$11\times3\frac{1}{2}\times\cdot52$
18000		$8\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$9\times3\frac{1}{2}\times\cdot48$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$10\times3\frac{1}{2}\times\cdot50$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot52$	$11\times3\frac{1}{2}\times\cdot50$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot46$
19000		$8\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$9\times3\frac{1}{2}\times\cdot48$	$10\times3\frac{1}{2}\times\cdot44$	$10\times3\frac{1}{2}\times\cdot50$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$11\times3\frac{1}{2}\times\cdot44$	$11\times3\frac{1}{2}\times\cdot50$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot46$
20000		$8\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$10\times3\frac{1}{2}\times\cdot46$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$11\times3\frac{1}{2}\times\cdot46$	$11\times3\frac{1}{2}\times\cdot52$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$
21000		$9\times3\frac{1}{2}\times\cdot42$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot42$	$10\times3\frac{1}{2}\times\cdot46$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$11\times3\frac{1}{2}\times\cdot44$	$11\times3\frac{1}{2}\times\cdot46$	$11\times3\frac{1}{2}\times\cdot52$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$
22000		$9\times3\frac{1}{2}\times\cdot44$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$10\times3\frac{1}{2}\times\cdot48$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$11\times3\frac{1}{2}\times\cdot46$	$11\times3\frac{1}{2}\times\cdot48$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot52$
23000		$9\times3\frac{1}{2}\times\cdot44$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$10\times3\frac{1}{2}\times\cdot48$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$11\times3\frac{1}{2}\times\cdot46$	$11\times3\frac{1}{2}\times\cdot50$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot52$
24000		$9\frac{1}{2}\times3\frac{1}{2}\times\cdot40$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot46$	$10\times3\frac{1}{2}\times\cdot50$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$11\times3\frac{1}{2}\times\cdot48$	$11\times3\frac{1}{2}\times\cdot52$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot54$
25000		$9\frac{1}{2}\times3\frac{1}{2}\times\cdot44$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$10\times3\frac{1}{2}\times\cdot50$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$11\times3\frac{1}{2}\times\cdot50$	$11\times3\frac{1}{2}\times\cdot54$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot56$
26000	V	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot48$	$9\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$10\times3\frac{1}{2}\times\cdot50$	$10\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$11\times3\frac{1}{2}\times\cdot50$	$11\times3\frac{1}{2}\times\cdot54$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot50$	$11\frac{1}{2}\times3\frac{1}{2}\times\cdot56$

BULB ANGLES

SIDE LONGITUDINALS where ONE TRANSVERSE is FITTED in EACH TANK.

SPACING OF TRANSVERSES 12 FEET.

TABLE 10 *(Concluded.)*

FIRST LONGITUDINAL NUMERAL L × D	DISTANCE, IN FEET, OF LONGITUDINAL BELOW UPPER DECK AT SIDE.							
	24	26	28	30	32	34	36	38
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3000								
4000								
5000								
6000								
7000								
8000								
9000								
10000								
11000	11 × 3½ × ·50 21.4							
12000	11 × 3½ × ·50 31.4							
13000	11½ × 3½ × ·44 32.9	11½ × 3½ × ·46 33.5						
14000	11½ × 3½ × ·44 32.9	11½ × 3½ × ·48 34.1	11½ × 3½ × ·54 35.8					
15000	11½ × 3½ × ·46 33.5	11½ × 3½ × ·50 34.4	11½ × 3½ × ·56 36.3	12 × 3½ × ·50 34.4				
16000	11½ × 3½ × ·48 34.1	11½ × 3½ × ·52 35.3	11½ × 3½ × ·56 36.3	12 × 3½ × ·52 38.3				
17000	11½ × 3½ × ·50 34.4	11½ × 3½ × ·54 35.8	11½ × 3½ × ·58 36.8	12 × 3½ × ·54 38.9	12 × 3½ × ·58 40.0			
18000	11½ × 3½ × ·50 34.4	11½ × 3½ × ·54 35.8	11½ × 3½ × ·60 37.3	12 × 3½ × ·54 38.9	12 × 3½ × ·60 40.6			
19000	11½ × 3½ × ·52 35.3	11½ × 3½ × ·56 36.3	11½ × 3½ × ·60 37.3	12 × 3½ × ·56 39.5	12 × 3½ × ·60 40.6	12 × 3½ × ·64 41.6		
20000	11½ × 3½ × ·54 35.8	12 × 3½ × ·48 34.1	12 × 3½ × ·54 38.9	12 × 3½ × ·56 39.5	12 × 3½ × ·60 40.6	12 × 3½ × 3½ × ·48 42.2		
21000	11½ × 3½ × ·54 35.8	12 × 3½ × ·48 34.1	12 × 3½ × ·54 38.9	12 × 3½ × ·58 40.0	12 × 3½ × ·62 41.1	12 × 3½ × 3½ × ·50 43.0	12 × 3½ × 3½ × ·52 43.8	
22000	11½ × 3½ × ·56 36.3	12 × 3½ × ·50 34.4	12 × 3½ × ·56 39.5	12 × 3½ × ·58 40.0	12 × 3½ × ·64 41.6	12 × 3½ × 3½ × ·50 43.0	12 × 3½ × 3½ × ·52 43.8	
23000	11½ × 3½ × ·58 36.8	12 × 3½ × ·50 34.4	12 × 3½ × ·56 39.5	12 × 3½ × ·60 40.6	12 × 3½ × 3½ × ·48 42.2	12 × 3½ × 3½ × ·52 43.8	12 × 3½ × 3½ × ·54 44.6	
24000	11½ × 3½ × ·58 36.8	12 × 3½ × ·52 37.3	12 × 3½ × ·58 40.0	12 × 3½ × ·62 41.1	12 × 3½ × 3½ × ·50 43.0	12 × 3½ × 3½ × ·54 44.6	12 × 3½ × 3½ × ·56 46.4	12 × 3½ × 3½ × ·58 46.2
25000	11½ × 3½ × ·60 37.3	12 × 3½ × ·54 38.9	12 × 3½ × ·58 40.0	12 × 3½ × ·62 41.1	12 × 3½ × 3½ × ·50 43.0	12 × 3½ × 3½ × ·56 45.4	12 × 3½ × 3½ × ·58 46.2	12 × 3½ × 3½ × ·60 47.0
26000	11½ × 3½ × ·60 37.3	12 × 3½ × ·54 38.9	12 × 3½ × ·60 40.6	12 × 3½ × ·66 42.1	12 × 3½ × 3½ × ·52 43.8	12 × 3½ × 3½ × ·56 45.4	12 × 3½ × 3½ × ·60 47.0	12 × 3½ × 3½ × ·62 47.8

BULB ANGLES OR CHANNELS

SIDE LONGITUDINALS where MORE than ONE TRANSVERSE is FITTED in EACH TANK.

SPACING OF TRANSVERSES 8 FEET.

TABLE 11

(See Continuation.)

FIRST LONGITUDINAL NUMERAL L × D	IN 'TWEEN DECKS.	DISTANCE, IN FEET, OF LONGITUDINAL BELOW UPPER DECK AT SIDE.						
		10	12	14	16	18	20	22
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3000	5 × 3 × ·36	6 × 3 × ·38	7 × 3 × ·36					
4000	5 × 3 × ·36	6½ × 3 × ·34	7 × 3 × ·36					
5000	5½ × 3 × ·36	6½ × 3 × ·36	7 × 3 × ·36	7½ × 3 × ·36				
6000	6 × 3 × ·36	6½ × 3 × ·38	7 × 3 × ·38	7½ × 3 × ·38	7½ × 3 × ·40			
7000	6 × 3½ × ·36	6½ × 3½ × ·40	7 × 3½ × ·40	7½ × 3½ × ·40	7½ × 3½ × ·40	8 × 3½ × ·44		
8000	6 × 3½ × ·36	6½ × 3½ × ·42	7 × 3½ × ·42	7½ × 3½ × ·42	8 × 3½ × ·40	8 × 3½ × ·46	8½ × 3½ × ·42	
9000	6 × 3½ × ·38	6½ × 3½ × ·42	7 × 3½ × ·42	7½ × 3½ × ·42	8 × 3½ × ·40	8 × 3½ × ·46	8½ × 3½ × ·44	9 × 3½ × ·40
10000	6½ × 3½ × ·38	7 × 3½ × ·38	7½ × 3½ × ·38	7½ × 3½ × ·44	8 × 3½ × ·42	8½ × 3½ × ·40	8½ × 3½ × ·44	9 × 3½ × ·40
11000	6½ × 3½ × ·38	7 × 3½ × ·38	7½ × 3½ × ·38	7½ × 3½ × ·46	8 × 3½ × ·42	8½ × 3½ × ·40	8½ × 3½ × ·46	9 × 3½ × ·42
12000	6½ × 3½ × ·40	7 × 3½ × ·40	7½ × 3½ × ·40	7½ × 3½ × ·46	8 × 3½ × ·44	8½ × 3½ × ·42	8½ × 3½ × ·46	9 × 3½ × ·42
13000	6½ × 3½ × ·40	7 × 3½ × ·40	7½ × 3½ × ·40	8 × 3½ × ·40	8 × 3½ × ·46	8½ × 3½ × ·44	9 × 3½ × ·40	9 × 3½ × ·44
14000	6½ × 3½ × ·42	7 × 3½ × ·42	7½ × 3½ × ·42	8 × 3½ × ·42	8 × 3½ × ·46	8½ × 3½ × ·44	9 × 3½ × ·40	9 × 3½ × ·46
15000	6½ × 3½ × ·42	7 × 3½ × ·42	7½ × 3½ × ·42	8 × 3½ × ·44	8½ × 3½ × ·42	8½ × 3½ × ·46	9 × 3½ × ·42	9 × 3½ × ·48
16000	7 × 3½ × ·40	7 × 3½ × ·44	7½ × 3½ × ·44	8 × 3½ × ·44	8½ × 3½ × ·42	8½ × 3½ × ·46	9 × 3½ × ·42	9 × 3½ × ·48
17000	7 × 3½ × ·40	7½ × 3½ × ·38	7½ × 3½ × ·44	8 × 3½ × ·46	8½ × 3½ × ·44	9 × 3½ × ·40	9 × 3½ × ·44	9½ × 3½ × ·42
18000	7 × 3½ × ·42	7½ × 3½ × ·38	7½ × 3½ × ·46	8 × 3½ × ·46	8½ × 3½ × ·44	9 × 3½ × ·40	9 × 3½ × ·44	9½ × 3½ × ·42
19000	7 × 3½ × ·42	7½ × 3½ × ·40	8 × 3½ × ·40	8 × 3½ × ·48	8½ × 3½ × ·46	9 × 3½ × ·42	9 × 3½ × ·46	9½ × 3½ × ·44
20000	7 × 3½ × ·44	7½ × 3½ × ·40	8 × 3½ × ·40	8 × 3½ × ·48	8½ × 3½ × ·46	9 × 3½ × ·42	9 × 3½ × ·46	9½ × 3½ × ·44
21000	7 × 3½ × ·44	7½ × 3½ × ·42	8 × 3½ × ·42	8½ × 3½ × ·42	8½ × 3½ × ·48	9 × 3½ × ·44	9 × 3½ × ·48	9½ × 3½ × ·46
22000	7½ × 3½ × ·42	8 × 3½ × ·40	8 × 3½ × ·42	8½ × 3½ × ·42	8½ × 3½ × ·48	9 × 3½ × ·44	9 × 3½ × ·50	9½ × 3½ × ·46
23000	7½ × 3½ × ·44	8 × 3½ × ·40	8 × 3½ × ·44	8½ × 3½ × ·44	8½ × 3½ × ·50	9 × 3½ × ·46	9 × 3½ × ·50	9½ × 3½ × ·48
24000	7½ × 3½ × ·44	8 × 3½ × ·42	8 × 3½ × ·46	8½ × 3½ × ·44	8½ × 3½ × ·50	9 × 3½ × ·46	9½ × 3½ × ·44	9½ × 3½ × ·48
25000	8 × 3½ × ·42	8 × 3½ × ·44	8 × 3½ × ·48	8½ × 3½ × ·46	9 × 3½ × ·44	9 × 3½ × ·48	9½ × 3½ × ·44	9½ × 3½ × ·50
26000	8 × 3½ × ·44	8 × 3½ × ·46	8 × 3½ × ·48	8½ × 3½ × ·46	9 × 3½ × ·44	9 × 3½ × ·50	9½ × 3½ × ·46	9½ × 3½ × ·50

BULB ANGLES

SIDE LONGITUDINALS where MORE than ONE TRANSVERSE is FITTED in EACH TANK.

TABLE 11

SPACING OF TRANSVERSES 8 FEET.

(See Continuation.)

FIRST LONGITUDINAL NUMERAL L × D	DISTANCE, IN FEET, OF LONGITUDINAL BELOW UPPER DECK AT SIDE.							
	24	26	28	30	32	34	36	38
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3000								
4000								
5000								
6000								
7000								
8000								
9000								
10000								
11000	9 × 3½ × ·48 19.85							
12000	9½ × 3½ × ·42 20.85							
13000	9½ × 3½ × ·42 20.85	9½ × 3½ × ·46 21.85						
14000	9½ × 3½ × ·44 21.35	9½ × 3½ × ·48 22.30	10 × 3½ × ·44 23.85					
15000	9½ × 3½ × ·44 21.35	9½ × 3½ × ·48 22.30	10 × 3½ × ·44 23.95	10 × 3½ × ·48 24.65				
16000	9½ × 3½ × ·46 21.85	9½ × 3½ × ·50 22.45	10 × 3½ × ·46 24.35	10 × 3½ × ·50 25.35				
17000	9½ × 3½ × ·46 21.85	9½ × 3½ × ·50 22.45	10 × 3½ × ·46 24.35	10 × 3½ × ·50 25.31	10½ × 3½ × ·46 24.5			
18000	9½ × 3½ × ·48 22.30	10 × 3½ × ·44 23.85	10 × 3½ × ·48 24.85	10 × 3½ × ·52 25.80	10½ × 3½ × ·46 24.5			
19000	9½ × 3½ × ·48 22.30	10 × 3½ × ·44 23.55	10 × 3½ × ·48 24.55	10 × 3½ × ·52 25.80	10½ × 3½ × ·48 28.0			
20000	9½ × 3½ × ·50 22.75	10 × 3½ × ·46 24.35	10 × 3½ × ·50 25.35	10 × 3½ × ·54 26.30	10½ × 3½ × ·48 28.0	10½ × 3½ × ·50 28.5		
21000	9½ × 3½ × ·50 22.75	10 × 3½ × ·46 24.35	10 × 3½ × ·50 25.35	10 × 3½ × ·54 26.30	10½ × 3½ × ·50 28.5	10½ × 3½ × ·52 29.0	11 × 3½ × ·44 29.4	
22000	10 × 3½ × ·44 23.85	10 × 3½ × ·48 24.55	10 × 3½ × ·52 25.80	10 × 3½ × ·56 26.75	10½ × 3½ × ·50 28.15	10½ × 3½ × ·52 29.0	11 × 3½ × ·46 30.3	
23000	10 × 3½ × ·44 23.85	10 × 3½ × ·48 24.55	10 × 3½ × ·52 25.80	10 × 3½ × ·56 26.75	10½ × 3½ × ·50 28.15	10½ × 3½ × ·54 29.5	11 × 3½ × ·48 30.9	
24000	10 × 3½ × ·46 24.35	10 × 3½ × ·50 25.35	10 × 3½ × ·54 26.30	10 × 3½ × ·58 27.25	10½ × 3½ × ·52 29.0	10½ × 3½ × ·54 29.5	11 × 3½ × ·48 30.9	11 × 3½ × ·52 31.9
25000	10 × 3½ × ·46 24.35	10 × 3½ × ·50 25.35	10 × 3½ × ·54 26.3	10½ × 3½ × ·50 28.8	10½ × 3½ × ·54 29.5	10½ × 3½ × ·56 30.0	11 × 3½ × ·50 31.4	11 × 3½ × ·54 32.4
26000	10 × 3½ × ·48 24.85	10 × 3½ × ·50 25.38	10 × 3½ × ·54 26.3	10½ × 3½ × ·50 28.8	10½ × 3½ × ·54 29.5	10½ × 3½ × ·56 30.0	11 × 3½ × ·50 31.4	11 × 3½ × ·54 32.4

BULB ANGLES

SIDE LONGITUDINALS where MORE than ONE TRANSVERSE is FITTED in EACH TANK.

SPACING OF TRANSVERSES 10 FEET.

TABLE 11

(See Continuation.)

FIRST LONGITUDINAL NUMERAL L × D	IN 'TWEEN DECKS.	DISTANCE, IN FEET, OF LONGITUDINAL BELOW UPPER DECK AT SIDE.						
		10	12	14	16	18	20	22
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3000	6 × 3 × ·34	7 × 3 × ·40	7½ × 3 × ·44					
4000	6½ × 3 × ·36	7½ × 3 × ·40	8 × 3 × ·44					
5000	6½ × 3 × ·38	7½ × 3 × ·40	8½ × 3 × ·40	8½ × 3 × ·48				
6000	7 × 3 × ·36	8 × 3 × ·40	8½ × 3 × ·40	9 × 3 × ·42	9 × 3 × ·48			
7000	7 × 3½ × ·36	8 × 3½ × ·42	8½ × 3½ × ·42	9 × 3½ × ·42	9½ × 3½ × ·42	9½ × 3½ × ·48		
8000	7 × 3½ × ·38	8 × 3½ × ·44	8½ × 3½ × ·44	9 × 3½ × ·44	9½ × 3½ × ·44	9½ × 3½ × ·50	10 × 3½ × ·50	
9000	7 × 3½ × ·40	8½ × 3½ × ·40	8½ × 3½ × ·46	9 × 3½ × ·46	9½ × 3½ × ·46	10 × 3½ × ·44	10 × 3½ × ·52	10½ × 3½ × ·46
10000	7 × 3½ × ·40	8½ × 3½ × ·40	8½ × 3½ × ·48	9 × 3½ × ·48	9½ × 3½ × ·48	10 × 3½ × ·46	10 × 3½ × ·52	10½ × 3½ × ·48
11000	7½ × 3½ × ·40	8½ × 3½ × ·42	9 × 3½ × ·42	9½ × 3½ × ·42	9½ × 3½ × ·50	10 × 3½ × ·48	10½ × 3½ × ·46	10½ × 3½ × ·50
12000	7½ × 3½ × ·40	8½ × 3½ × ·42	9 × 3½ × ·42	9½ × 3½ × ·44	9½ × 3½ × ·50	10 × 3½ × ·50	10½ × 3½ × ·46	10½ × 3½ × ·52
13000	7½ × 3½ × ·42	8½ × 3½ × ·44	9 × 3½ × ·44	9½ × 3½ × ·46	10 × 3½ × ·44	10 × 3½ × ·52	10½ × 3½ × ·48	11 × 3½ × ·46
14000	7½ × 3½ × ·42	9 × 3½ × ·40	9 × 3½ × ·46	9½ × 3½ × ·48	10 × 3½ × ·46	10 × 3½ × ·52	10½ × 3½ × ·50	11 × 3½ × ·46
15000	7½ × 3½ × ·44	9 × 3½ × ·40	9 × 3½ × ·48	9½ × 3½ × ·48	10 × 3½ × ·48	10½ × 3½ × ·46	10½ × 3½ × ·50	11 × 3½ × ·48
16000	8 × 3½ × ·40	9 × 3½ × ·42	9 × 3½ × ·48	9½ × 3½ × ·48	10 × 3½ × ·50	10½ × 3½ × ·46	10½ × 3½ × ·52	11 × 3½ × ·48
17000	8 × 3½ × ·40	9 × 3½ × ·42	9½ × 3½ × ·44	10 × 3½ × ·44	10 × 3½ × ·50	10½ × 3½ × ·48	10½ × 3½ × ·52	11 × 3½ × ·50
18000	8 × 3½ × ·42	9 × 3½ × ·44	9½ × 3½ × ·44	10 × 3½ × ·44	10 × 3½ × ·52	10½ × 3½ × ·48	11 × 3½ × ·46	11 × 3½ × ·50
19000	8 × 3½ × ·42	9 × 3½ × ·44	9½ × 3½ × ·46	10 × 3½ × ·46	10 × 3½ × ·52	10½ × 3½ × ·50	11 × 3½ × ·46	11 × 3½ × ·52
20000	8 × 3½ × ·44	9 × 3½ × ·44	9½ × 3½ × ·46	10 × 3½ × ·46	10 × 3½ × ·54	10½ × 3½ × ·50	11 × 3½ × ·48	11 × 3½ × ·52
21000	8½ × 3½ × ·42	9½ × 3½ × ·40	9½ × 3½ × ·48	10 × 3½ × ·48	10½ × 3½ × ·48	10½ × 3½ × ·52	11 × 3½ × ·50	11½ × 3½ × ·46
22000	8½ × 3½ × ·44	9½ × 3½ × ·42	9½ × 3½ × ·48	10 × 3½ × ·48	10½ × 3½ × ·48	10½ × 3½ × ·52	11 × 3½ × ·50	11½ × 3½ × ·48
23000	8½ × 3½ × ·44	9½ × 3½ × ·42	9½ × 3½ × ·50	10 × 3½ × ·50	10½ × 3½ × ·50	11 × 3½ × ·46	11 × 3½ × ·52	11½ × 3½ × ·48
24000	9 × 3½ × ·40	9½ × 3½ × ·44	9½ × 3½ × ·52	10 × 3½ × ·52	10½ × 3½ × ·52	11 × 3½ × ·48	11 × 3½ × ·54	11½ × 3½ × ·50
25000	9 × 3½ × ·44	9½ × 3½ × ·44	9½ × 3½ × ·52	10 × 3½ × ·54	10½ × 3½ × ·54	11 × 3½ × ·50	11 × 3½ × ·54	11½ × 3½ × ·52
26000	9 × 3½ × ·48	9½ × 3½ × ·46	9½ × 3½ × ·54	10 × 3½ × ·54	10½ × 3½ × ·56	11 × 3½ × ·50	11 × 3½ × ·56	11½ × 3½ × ·52

BULB ANGLES

SIDE LONGITUDINALS where MORE than ONE TRANSVERSE is FITTED in EACH TANK.

SPACING OF TRANSVERSES 10 FEET.

TABLE 11 *(Concluded.)*

FIRST LONGITUDINAL NUMERAL L × D		DISTANCE, IN FEET, OF LONGITUDINAL BELOW UPPER DECK AT SIDE.							
		24	26	28	30	32	34	36	38
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
3000	∧								
4000									
5000									
6000									
7000									
8000									
9000									
10000									
11000		11 × 3½ × ·46 30·3							
12000		11 × 3½ × ·46 30·3							
13000		11 × 3½ × ·48 30·9	11½ × 3½ × ·46 33·5						
14000		11 × 3½ × ·50 31·4	11½ × 3½ × ·46 33·5	11½ × 3½ × ·50 34·4					
15000		11 × 3½ × ·52 31·9	11½ × 3½ × ·48 34·1	11½ × 3½ × ·52 35·3	11½ × 3½ × ·56 36·3				
16000		11 × 3½ × ·52 31·9	11½ × 3½ × ·48 34·1	11½ × 3½ × ·52 35·3	12 × 3½ × ·50 34·4				
17000		11½ × 3½ × ·46 33·5	11½ × 3½ × ·50 34·4	11½ × 3½ × ·54 35·9	12 × 3½ × ·52 38·3	12 × 3½ × ·56 39·5			
18000		11½ × 3½ × ·46 33·5	11½ × 3½ × ·52 35·3	11½ × 3½ × ·56 36·3	12 × 3½ × ·52 38·3	12 × 3½ × ·56 39·5			
19000		11½ × 3½ × ·48 34·1	11½ × 3½ × ·52 35·3	11½ × 3½ × ·56 36·3	12 × 3½ × ·54 38·9	12 × 3½ × ·58 40·0			
20000		11½ × 3½ × ·50 34·4	11½ × 3½ × ·54 35·9	12 × 3½ × ·50 34·4	12 × 3½ × ·54 38·9	12 × 3½ × ·58 40·0	12 × 3½ × 3½ × ·46 41·4		
21000		11½ × 3½ × ·50 34·4	11½ × 3½ × ·56 36·3	12 × 3½ × ·52 35·3	12 × 3½ × ·56 39·5	12 × 3½ × ·60 40·6	12 × 3½ × 3½ × ·48 42·2	12 × 3½ × 3½ × ·50 43·0	
22000		11½ × 3½ × ·52 35·3	11½ × 3½ × ·56 36·3	12 × 3½ × ·52 35·3	12 × 3½ × ·56 39·5	12 × 3½ × ·62 41·1	12 × 3½ × 3½ × ·48 42·2	12 × 3½ × 3½ × ·50 43·0	
23000		11½ × 3½ × ·54 35·9	11½ × 3½ × ·58 36·9	12 × 3½ × ·54 35·9	12 × 3½ × ·58 40·0	12 × 3½ × 3½ × ·46 41·4	12 × 3½ × 3½ × ·50 43·0	12 × 3½ × 3½ × ·52 43·8	
24000		11½ × 3½ × ·54 35·9	12 × 3½ × ·52 38·3	12 × 3½ × ·56 39·5	12 × 3½ × ·60 40·6	12 × 3½ × 3½ × ·48 42·2	12 × 3½ × 3½ × ·52 43·8	12 × 3½ × 3½ × ·54 44·6	12 × 3½ × 3½ × ·56 45·4
25000		11½ × 3½ × ·56 36·3	12 × 3½ × ·52 38·3	12 × 3½ × ·56 39·5	12 × 3½ × ·60 40·6	12 × 3½ × 3½ × ·50 43·0	12 × 3½ × 3½ × ·54 44·6	12 × 3½ × 3½ × ·56 45·4	12 × 3½ × 3½ × ·58 46·2
26000	∨	11½ × 3½ × ·56 36·3	12 × 3½ × ·54 38·9	12 × 3½ × ·58 40·0	12 × 3½ × ·62 41·1	12 × 3½ × 3½ × ·50 43·0	12 × 3½ × 3½ × ·54 44·6	12 × 3½ × 3½ × ·56 45·4	12 × 3½ × 3½ × ·60 44·0

BULB ANGLES OR CHANNELS

RIVET ATTACHMENT of STIFFENING BARS of TRANSVERSES to LONGITUDINALS.

TABLE 12

DEPTH AND TYPE OF LONGITUDINALS.	DIMENSIONS OF STIFFENING BAR.					
	3 and $3\frac{1}{2}$ Inch.		5 Inch.		6 Inch.	
	RIVET ATTACHMENT.		RIVET ATTACHMENT.		RIVET ATTACHMENT.	
	No.	Diameter.	No.	Diameter.	No.	Diameter.
		Inch.		Inch.		Inch.
Bulb Angles not exceeding ... ... Inches. $7\frac{1}{2}$	2	$\frac{3}{4}$	3	$\frac{3}{4}$	4	$\frac{3}{4}$
Bulb Angles ... ... 8 to $9\frac{1}{2}$	2	$\frac{3}{4}$	4	$\frac{3}{4}$	4	$\frac{7}{8}$
Bulb Angles ... ... 10 to $11\frac{1}{2}$	2	$\frac{7}{8}$	5	$\frac{3}{4}$	5	$\frac{7}{8}$
Bulb Angles or Channel 12	3	$\frac{7}{8}$	5	$\frac{7}{8}$	6	$\frac{7}{8}$
Channel ... ... 13 and 14	3	$\frac{7}{8}$			6	$\frac{7}{8}$
Channel or Built ... ... 15 to 18	4	$\frac{7}{8}$			8	$\frac{7}{8}$
Built ... ... 19 to 20	5	$\frac{7}{8}$			10	$\frac{7}{8}$

LLOYD'S REGISTER OF SHIPPING, LONDON—*5th March*, 1925.

BULKHEAD BRACKETS to BOTTOM and SIDE LONGITUDINALS.

BOTTOM LONGITUDINALS. TABLE 13

TYPE AND DEPTH OF LONGITUDINAL.		LENGTH OF ARM OF BRACKET.		THICKNESS OF BRACKET.	RIVETS IN ARM TO LONGITUDINAL.		RIVETS IN ARM TO BULKHEAD.	
		To Longitudinal.	To Bulkhead.		Number.	Diameter.	Number.	Diameter.
	Inches.	Inches.	Inches.	Inches.		Inches.		Inches.
Bulb Angle	9	42	42	·40	12	$\frac{7}{8}$	9	$\frac{7}{8}$
,,	10	45	45	·40	13	$\frac{7}{8}$	10	$\frac{7}{8}$
,,	11	48	48	·42	14	$\frac{7}{8}$	11	$\frac{7}{8}$
,,	12	50	50	·42	15	$\frac{7}{8}$	11	$\frac{7}{8}$
Channel	12	52	52	·44	16	$\frac{7}{8}$	12	$\frac{7}{8}$
,,	13	53	53	·44	17	$\frac{7}{8}$	13	$\frac{7}{8}$
,,	14	54	54	·44	18	$\frac{7}{8}$	14	$\frac{7}{8}$
,,	15	55	55	·44	19	$\frac{7}{8}$	14	$\frac{7}{8}$
Built Type	15	48	55	·44	Quadruple Riveted Overlap		14	$\frac{7}{8}$
,,	16	49	57	·44	,,		15	$\frac{7}{8}$
,,	17	50	59	·44	,,		15	$\frac{7}{8}$
,,	18	52	61	·46	,,		16	$\frac{7}{8}$
,,	19	54	63	·46	,,		17	$\frac{7}{8}$
,,	20	56	65	·46	,,		18	$\frac{7}{8}$

SIDE LONGITUDINALS.

TYPE AND DEPTH OF LONGITUDINAL.		LENGTH OF EACH ARM OF BRACKET.	THICKNESS OF BRACKET.	RIVETS IN ARM OF BRACKET.	
				Number.	Diameter.
	Inches.	Inches.	Inches.		
Bulb Angle	5	21	·40	5	$\frac{7}{8}$
,,	6	25	·40	6	$\frac{7}{8}$
,,	7	28	·40	7	$\frac{7}{8}$
,,	8	32	·40	8	$\frac{7}{8}$
,,	9	35	·42	9	$\frac{7}{8}$
,,	10	38	·42	10	$\frac{7}{8}$
,,	11	41	·44	11	$\frac{7}{8}$
,,	12	44	·44	11	$\frac{7}{8}$
Channel	12	44	·44	12	$\frac{7}{8}$
,,	13	46	·44	13	$\frac{7}{8}$
,,	14	48	·44	14	$\frac{7}{8}$
,,	15	50	·44	14	$\frac{7}{8}$

Where longitudinals of intermediate size are fitted the number of rivets is to be as required for the nearest larger size tabulated.

UPPER DECK LONGITUDINALS. TABLE 14

WHERE MORE THAN ONE TRANSVERSE IS FITTED IN EACH TANK.					WHERE ONE TRANSVERSE ONLY IS FITTED IN EACH TANK.				
FIRST LONGITUDINAL NUMERAL L × D		SPAN IN FEET. 8	9	10	FIRST LONGITUDINAL NUMERAL. L × D		OVERALL SPAN IN FEET. 10	11	12
	∧	Inches.	Inches.	Inches.		∧	Inches.	Inches.	Inches.
4500		$5\frac{1}{2} \times 3 \times .40$	$6 \times 3 \times .40$	$6 \times 3 \times .46$	4500		$6 \times 3 \times .40$	$6\frac{1}{2} \times 3 \times .38$	$6\frac{1}{2} \times 3 \times .44$
6000		$5\frac{1}{2} \times 3 \times .44$	$6 \times 3 \times .42$	$6\frac{1}{2} \times 3 \times .40$	6000		$6 \times 3 \times .42$	$6\frac{1}{2} \times 3 \times .40$	$6\frac{1}{2} \times 3 \times .46$
7550		$6 \times 3 \times .38$	$6 \times 3 \times .44$	$6\frac{1}{2} \times 3 \times .42$	7550		$6 \times 3 \times .44$	$6\frac{1}{2} \times 3 \times .42$	$7 \times 3 \times .40$
9150		$6 \times 3 \times .42$	$6 \times 3 \times .46$	$6\frac{1}{2} \times 3 \times .44$	9150		$6 \times 3 \times .46$	$6\frac{1}{2} \times 3 \times .44$	$7 \times 3 \times .42$
10800		$6 \times 3 \times .44$	$6 \times 3 \times .48$	$6\frac{1}{2} \times 3 \times .46$	10800		$6\frac{1}{2} \times 3 \times .40$	$6\frac{1}{2} \times 3 \times .46$	$7 \times 3 \times .44$
12500		$6\frac{1}{2} \times 3 \times .38$	$6\frac{1}{2} \times 3 \times .42$	$7 \times 3 \times .40$	12500		$6\frac{1}{2} \times 3 \times .42$	$7 \times 3 \times .40$	$7 \times 3 \times .46$
14250		$6\frac{1}{2} \times 3 \times .40$	$6\frac{1}{2} \times 3 \times .44$	$7 \times 3 \times .42$	14250		$6\frac{1}{2} \times 3 \times .44$	$7 \times 3 \times .42$	$7\frac{1}{2} \times 3 \times .40$
16000		$6\frac{1}{2} \times 3 \times .42$	$6\frac{1}{2} \times 3 \times .46$	$7 \times 3 \times .44$	16000		$6\frac{1}{2} \times 3 \times .46$	$7 \times 3 \times .44$	$7\frac{1}{2} \times 3 \times .42$
17800		$6\frac{1}{2} \times 3\frac{1}{2} \times .44$.	$6\frac{1}{2} \times 3\frac{1}{2} \times .48$	$7 \times 3\frac{1}{2} \times .46$	17800		$7 \times 3\frac{1}{2} \times .40$	$7 \times 3\frac{1}{2} \times .46$	$7\frac{1}{2} \times 3\frac{1}{2} \times .44$
19650		$6\frac{1}{2} \times 3\frac{1}{2} \times .46$	$7 \times 3\frac{1}{2} \times .42$	$7\frac{1}{2} \times 3\frac{1}{2} \times .40$	19650		$7 \times 3\frac{1}{2} \times .42$	$7\frac{1}{2} \times 3\frac{1}{2} \times .40$	$7\frac{1}{2} \times 3\frac{1}{2} \times .46$
21550		$6\frac{1}{2} \times 3\frac{1}{2} \times .48$	$7 \times 3\frac{1}{2} \times .44$	$7\frac{1}{2} \times 3\frac{1}{2} \times .42$	21550		$7 \times 3\frac{1}{2} \times .44$	$7\frac{1}{2} \times 3\frac{1}{2} \times .42$	$8 \times 3\frac{1}{2} \times .40$
23500		$7 \times 3\frac{1}{2} \times .40$	$7 \times 3\frac{1}{2} \times .46$	$7\frac{1}{2} \times 3\frac{1}{2} \times .44$	23500		$7 \times 3\frac{1}{2} \times .46$	$7\frac{1}{2} \times 3\frac{1}{2} \times .44$	$8 \times 3\frac{1}{2} \times .42$
25500	∨	$7 \times 3\frac{1}{2} \times .42$	$7 \times 3\frac{1}{2} \times .48$	$7\frac{1}{2} \times 3\frac{1}{2} \times .46$	25550	∨	$7 \times 3\frac{1}{2} \times .48$	$7\frac{1}{2} \times 3\frac{1}{2} \times .46$	$8 \times 3\frac{1}{2} \times .44$

BULB ANGLES

SECOND DECK LONGITUDINALS. TABLE 15

WHERE MORE THAN ONE TRANSVERSE IS FITTED IN EACH TANK.					WHERE ONE TRANSVERSE ONLY IS FITTED IN EACH TANK.				
FIRST LONGITUDINAL NUMERAL L × D		SPAN IN FEET.			FIRST LONGITUDINAL NUMERAL L × D		OVERALL SPAN IN FEET.		
		8	9	10			10	11	12
	∧	Inches.	Inches.	Inches.		∧	Inches.	Inches.	Inches.
4500		6 × 3 × ·44	6½ × 3 × ·42	7 × 3 × ·40	4500		6½ × 3 × ·42	7 × 3 × ·40	7½ × 3 × ·38
6000		6 × 3 × ·46	6½ × 3 × ·44	7 × 3 × ·42	6000		6½ × 3 × ·44	7 × 3 × ·42	7½ × 3 × ·40
7550		6½ × 3 × ·40	7 × 3 × ·38	7 × 3 × ·44	7550		6½ × 3 × ·46	7 × 3 × ·44	7½ × 3 × ·42
9150		6½ × 3 × ·42	7 × 3 × ·40	7 × 3 × ·46	9150		7 × 3 × ·40	7 × 3 × ·46	7½ × 3 × ·44
10800		6½ × 3 × ·44	7 × 3 × ·42	7½ × 3 × ·40	10800		7 × 3 × ·42	7½ × 3 × ·40	7½ × 3 × ·46
12500	BULB ANGLES	6½ × 3 × ·46	7 × 3 × ·44	7½ × 3 × ·42	12500	BULB ANGLES	7 × 3 × ·44	7½ × 3 × ·42	8 × 3 × ·40
14250		7 × 3 × ·40	7½ × 3 × ·38	7½ × 3 × ·44	14250		7 × 3 × ·46	7½ × 3 × ·44	8 × 3 × ·42
16000		7 × 3 × ·42	7½ × 3 × ·40	7½ × 3 × ·46	16000		7 × 3 × ·48	7½ × 3 × ·46	8 × 3 × ·44
17800		7 × 3½ × ·44	7½ × 3½ × ·42	8 × 3½ × ·40	17800		7½ × 3½ × ·42	8 × 3½ × ·40	8 × 3½ × ·46
19650		7 × 3½ × ·46	7½ × 3½ × ·44	8 × 3½ × ·42	19650		7½ × 3½ × ·44	8 × 3½ × ·42	8½ × 3½ × ·40
21550		7½ × 3½ × ·42	8 × 3½ × ·38	8 × 3½ × ·44	21550		7½ × 3½ × ·46	8 × 3½ × ·44	8½ × 3½ × ·42
23500		7½ × 3½ × ·44	8 × 3½ × ·40	8 × 3½ × ·46	23500		7½ × 3½ × ·48	8 × 3½ × ·46	8½ × 3½ × ·44
25500	∨	7½ × 3½ × ·46	8 × 3½ × ·42	8 × 3½ × ·48	25550	∨	8 × 3½ × ·42	8 × 3½ × ·48	8½ × 3½ × ·46

TABLE 16

RIVETS in BRACKETS to DECK LONGITUDINALS.

DEPTH OF LONGITUDINAL.	NUMBER AND DIAMETER OF RIVETS.				LENGTH OF EACH ARM OF BRACKET.	THICKNESS OF BRACKET TO UPPER DECK LONGITUDINALS.	THICKNESS OF BRACKET TO SECOND DECK LONGITUDINALS.
	UPPER DECK.		SECOND DECK.				
Inches.	Number.	Diameter.	Number.	Diameter.	Inches.	Inches.	Inches.
5	5	$\frac{7}{8}$	5	$\frac{7}{8}$	20	·40	·40
$5\frac{1}{2}$	5	$\frac{7}{8}$	6	$\frac{7}{8}$	22	·40	·40
6	6	$\frac{7}{8}$	6	$\frac{7}{8}$	24	·40	·40
$6\frac{1}{2}$	6	$\frac{7}{8}$	7	$\frac{7}{8}$	26	·40	·42
7	7	$\frac{7}{8}$	7	$\frac{7}{8}$	28	·42	·42
$7\frac{1}{2}$	7	$\frac{7}{8}$	8	$\frac{7}{8}$	30	·42	·44
8	7	$\frac{7}{8}$	8	$\frac{7}{8}$	32	·42	·44
$8\frac{1}{2}$	8	$\frac{7}{8}$	9	$\frac{7}{8}$	34	·44	·44
9	8	$\frac{7}{8}$	9	$\frac{7}{8}$	36	·44	·44
$9\frac{1}{2}$	8	$\frac{7}{8}$	9	$\frac{7}{8}$	38	·44	·44

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SHELL PLATING. TABLE 17

FIRST LONGITUDINAL NUMERAL L × D	BREADTH OF FLAT PLATE KEEL.	THICKNESS OF FLAT PLATE KEEL.		THICKNESS OF SHELL PLATING.				
				FROM FLAT PLATE KEEL TO UPPER TURN OF BILGE.		FROM UPPER TURN OF BILGE TO STRAKE BELOW SHEERSTRAKE.		PROPELLER BOSS PLATES.
		For $\frac{3}{5}$-Length Amidships.	At Ends.	For $\frac{1}{2}$-Length Amidships.	At Ends.	For $\frac{1}{2}$-Length Amidships.	At Ends.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
4800	43	·66	·52	·46	·38	·44	·38	·48
5900	44	·70	·54	·48	·40	·46	·40	·52
7000	45	·74	·58	·50	·42	·48	·40	·56
8200	47	·78	·60	·52	·42	·50	·42	·60
9400	48	·82	·62	·54	·44	·52	·42	·62
10600	49	·84	·64	·56	·46	·54	·44	·66
11800	50	·88	·68	·58	·46	·56	·44	·70
13000	51	·92	·70	·60	·48	·58	·46	·72
14200	52	·94	·74	·62	·50	·60	·46	·74
15400	53	·98	·78	·64	·50	·62	·48	·78
16700	54	1·02	·80	·66	·52	·64	·48	·80
18000	55	1·06	·82	·68	·52	·66	·50	·82
19300	56	1·10	·84	·72	·54	·66	·50	·84
20600	57	1·14	·88	·74	·56	·68	·52	·86
22000	59	1·18	·90	·76	·56	·70	·52	·88
23500	60	1·22	·94	·80	·58	·72	·54	·90
25000	61	1·26	·98	·82	·60	·74	·56	·92
26500	62	1·30	1·00	·84	·62	·76	·56	·94
28000	63	1·34	1·04	·86	·62	·76	·58	·96

TOPSIDE SCANTLINGS.

TABLE 18

(See Continuation.)

SECOND LONGITUDINAL NUMERAL L × (B + D)	BREADTH OF.		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK.							
			11				12			
			THICKNESS OF UPPER DECK, SHEERSTRAKE AND STRAKE BELOW.							
	Sheerstrake and Strake below.	Stringer Plate.	Sheerstrake.	Strake Below.	Stringer Plate.	Deck Plating.	Sheerstrake.	Strake Below.	Stringer Plate.	Deck Plating.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
15000	47	45	·50	·46	·48	·34	·52	·48	·50	·34
16000	47	45	·52	·48	·48	·34	·54	·50	·50	·34
17000	47	45	·52	·48	·48	·34	·54	·50	·50	·34
18000	48	45	·54	·50	·48	·34	·56	·52	·50	·34
19000	48	46	·54	·50	·48	·34	·56	·52	·50	·34
20000	48	46	·54	·50	·50	·36	·56	·54	·50	·36
21000	48	47	·56	·52	·50	·36	·58	·56	·52	·36
22000	48	48	·56	·52	·50	·36	·58	·56	·52	·36
23000	49	49	·58	·54	·50	·36	·60	·58	·52	·36
24000	49	50	·58	·56	·50	·38	·62	·58	·54	·38
25500	49	51	·60	·58	·50	·38	·64	·60	·54	·38
27000	49	52	·62	·60	·50	·38	·66	·62	·54	·38
28500	50	53	·64	·60	·50	·40	·68	·62	·54	·40
30000	50	54	·64	·62	·52	·40	·68	·64	·56	·42
31500	50	55	·66	·64	·52	·40	·70	·66	·56	·42
33000	50	56	·66	·64	·52	·40	·72	·66	·56	·44
34500	50	57	·68	·66	·54	·42	·74	·68	·58	·46
36000	50	58	·70	·66	·54	·42	·76	·70	·58	·48
37500	51	59	·70	·66	·56	·44	·76	·70	·60	·50
39000	51	60	·72	·68	·56	·46	·78	·72	·60	·50
40500	51	61	·74	·70	·58	·48	·80	·74	·62	·52
42000	51	62	·74	·70	·58	·48	·82	·74	·64	·54
43500	51	63	·76	·72	·60	·50	·84	·76	·64	·54
45000	52	64	·78	·74	·60	·50	·86	·78	·66	·56
46500	52	65	·78	·74	·62	·52	·86	·78	·66	·58
48000	52	66	·80	·76	·62	·54	·88	·80	·68	·60
50000	52	68	·80	·78	·64	·56	·88	·82	·68	·62
52000	53	69	·82	·78	·66	·58	·90	·82	·70	·64
54000	53	70	·84	·80	·66	·60	·92	·84	·72	·66
56000	53	72	·86	·82	68	·64	·94	·86	·74	·68
58000	54	74	·86	·82	·70	·66	·94	·86	·76	·70
60000	54	76	·88	·84	·72	·66	·96	·88	·78	·72
62000	54	77	·88	·84	·76	·68	·96	·88	·82	·74
64000	55	79	·90	·86	·78	·70	·98	·90	·84	·76
66000	55	80	·92	·88	·80	·74	1·00	·92	·88	·80

TOPSIDE SCANTLINGS.

TABLE 18
(Concluded.)

SECOND LONGITUDINAL NUMERAL L × (B + D)	BREADTH OF.		PROPORTION OF LENGTH OF VESSEL TO DEPTH TO UPPER DECK.								THICKNESSES AT ENDS.	
			13				13½					
			THICKNESS OF UPPER DECK, SHEERSTRAKE AND STRAKE BELOW.									
	Sheer-strake and Strake Below.	Stringer Plate.	Sheer-strake.	Strake Below.	Stringer Plate.	Deck Plating.	Sheer-strake.	Strake Below.	Stringer Plate.	Deck Plating.	Stringer Plate.	Deck Plating.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
15000	47	45	·58	·50	·50	·34	·60	·52	·52	·34	·36	·30
16000	47	45	·60	·52	·50	·34	·62	·54	·52	·34	·36	·30
17000	47	45	·60	·54	·52	·34	·64	·56	·54	·36	·36	·30
18000	48	45	·62	·54	·52	·36	·66	·56	·54	·38	·36	·30
19000	48	46	·64	·56	·54	·36	·66	·58	·56	·38	·38	·30
20000	48	46	·64	·56	·54	·36	·68	·58	·56	·38	·38	·30
21000	48	47	·66	·58	·56	·38	·70	·60	·58	·40	·38	·30
22000	48	48	·68	·60	·56	·38	·72	·62	·58	·40	·38	·30
23000	49	49	·70	·62	·56	·38	·74	·64	·58	·40	·38	·30
24000	49	50	·72	·64	·58	·38	·76	·66	·60	·40	·38	·32
25500	49	51	·74	·64	·58	·40	·78	·66	·60	·42	·40	·32
27000	49	52	·76	·66	·58	·40	·80	·68	·60	·42	·40	·32
28500	50	53	·78	·68	·58	·42	·82	·70	·62	·44	·40	·32
30000	50	54	·80	·70	·60	·44	·84	·72	·62	·46	·40	·34
31500	50	55	·82	·72	·62	·46	·86	·74	·64	·48	·42	·34
33000	50	56	·84	·72	·62	·48	·88	·74	·64	·50	·42	·34
34500	50	57	·86	·74	·64	·50	·90	·76	·66	·50	·42	·34
36000	50	58	·88	·76	·64	·50	·92	·78	·66	·52	·42	·36
37500	51	59	·88	·78	·66	·52	·94	·80	·66	·54	·44	·36
39000	51	60	·90	·80	·66	·54	·96	·82	·68	·56	·44	·36
40500	51	61	·92	·80	·66	·56	·96	·82	·68	·58	·44	·36
42000	51	62	·94	·82	·68	·58	·98	·84	·70	·60	·44	·36
43500	51	63	·96	·82	·68	·60	1·00	·86	·70	·62	·44	·36
45000	52	64	·98	·84	·70	·62	1·02	·88	·72	·64	·44	·36
46500	52	65	·98	·86	·72	·64	1·04	·90	·74	·66	·44	·36
48000	52	66	1·00	·88	·72	·66	1·06	·90	·76	·66	·44	·36
50000	52	68	1·02	·90	·74	·66	1·08	·92	·78	·68	·46	·36
52000	53	69	1·04	·90	·76	·68	1·10	·92	·80	·70	·46	·38
54000	53	70	1·06	·92	·78	·70	1·12	·94	·82	·74	·46	·38
56000	53	72	1·08	·94	·80	·74	1·14	·96	·84	·78	·46	·38
58000	54	74	1·10	·94	·84	·76	1·16	·98	·88	·80	·46	·38
60000	54	76	1·12	·96	·86	·78	1·18	1·00	·90	·82	·46	·38
62000	54	77	1·12	·98	·88	·82	1·20	1·02	·92	·86	·46	·38
64000	55	78	1·14	1·00	·90	·84	1·22	1·04	·94	·88	·48	·38
66000	55	80	1·16	1·02	·92	·86	1·24	1·08	·96	·92	·48	·38

+.01 for 2" increase in spacing

SECOND DECK PLATING. TABLE 19

L × (B + D)	BREADTH OF STRINGER PLATE.	THICKNESS.		STRINGER ANGLE.
		Stringer Plate.	Plating.	
	Inches.	Inches.	Inches.	Inches.
13800	42	·36	·34	5 × 5 × ·40
17700	43	·36	·34	6 × 6 × ·40
22100	44	·38	·36	6 × 6 × ·42
27000	45	·40	·38	6 × 6 × ·42
32400	47	·42	·40	6 × 6 × ·44
38300	48	·44	·42	6 × 6 × ·44
44600	50	·46	·44	6 × 6 × ·46
51000	51	·46	·46	6 × 6 × ·48
57400	53	·48	·48	6 × 6 × ·48
63800	54	·50	·50	6 × 6 × ·50

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TABLE 20

STRINGER ANGLES on UPPER DECK in WAY of OIL TANKS.

THICKNESS OF SHEERSTRAKE.			SIZE OF FLANGES.
Inches. Above		not exceeding	Inches.
—	and	·96	6 × 6
·96	„	1·14	7 × 7
1·14	„	1·20	8 × 8
The thickness of the Bars is to be the same as that of the Stringer Plate.			

TABLE 21

KEEL ANGLES.

FIRST LONGITUDINAL NUMERAL L × D	ANGLES CONNECTING CENTRE LINE BULKHEAD TO KEEL PLATE.	
	FOR ½ LENGTH AMIDSHIPS.	THICKNESS AT ENDS.
	Inches.	Inches.
5000	4 × 4 × ·48	·46
6000	4 × 4 × ·50	·48
7500	4 × 4 × ·52	·48
9500	4 × 4 × ·54	·50
12000	4 × 4 × ·56	·50
15000	4 × 4 × ·58	·52
18500	4 × 4 × ·60	·54
22500	4 × 4 × ·62	·56
27000	4 × 4 × ·64	·58

BULKHEAD PLATING. TABLE 22

DEPTH BELOW TOP OF BULKHEAD.	THICKNESS OF PLATING.	DEPTH BELOW TOP OF BULKHEAD.	THICKNESS OF PLATING.
Feet.	Inches.	Feet.	Inches.
6	·34	26	·42
10	·34	30	·44
14	·36	34	·46
18	·38	38	·48
22	·40	42	·50

Bottom Strake to be increased ·04.

TABLE 23

BULKHEAD BOUNDARY BARS.

DEPTH OF BULKHEAD.	ANGLES ATTACHING TRANSVERSE BULKHEADS TO SHELL PLATING, CENTRE LINE BULKHEAD, SECOND DECK, AND SIDES AND TOP OF EXPANSION TRUNK AND CENTRE LINE BULKHEAD TO DECK.	
	Double.	Single.
Feet.	Inches.	Inches.
18	3 × 3 × ·34	6 × 6 × ·42
22	3 × 3 × ·36	6 × 6 × ·44
26	3 × 3 × ·38	6 × 6 × ·46
30	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·38	6 × 6 × ·48
34	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·40	6 × 6 × ·50
38	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·42	6 × 6 × ·52
42	$3\frac{1}{2} \times 3\frac{1}{2} \times$ ·44	6 × 6 × ·54

TRANSVERSE BULKHEADS.

VERTICAL WEBS BELOW SECOND DECK.

TABLE 24

DEPTH FROM SECOND DECK TO INNER EDGE OF BOTTOM LONGITUDINALS.	PLATE AND FACE BAR.	SPACING OF WEBS.					
		Feet. Inches. 7 — 6		Feet. Inches. 8 — 6		Feet. Inches. 9 — 6	
		DEPTH FROM UPPER DECK AT CENTRE TO TOP OF WEB.					
		Feet. 8	Feet. 10	Feet. 8	Feet. 10	Feet. 8	Feet. 10
Feet. 10	Web	Inches. 16 × ·36	Inches.	Inches. 17 × ·36	Inches.	Inches. 18 × ·36	Inches.
	Face Angle	3 × 3 × ·28		3 × 3 × ·30		3 × 3 × ·32	
12	Web	19 × ·38		20 × ·38		21 × ·38	
	Face Angle	3 × 3 × ·32		3 × 3 × ·34		3 × 3 × ·36	
14	Web	22 × ·40	23 × ·40	22 × ·40	23 × ·40	23 × ·40	24 × ·40
	Face Angle	3 × 3 × ·36	3 × 3 × ·36	3 × 3 × ·38	3 × 3 × ·42	3 × 3 × ·42	4 × 3 × ·38
16	Web	24 × ·40	25 × ·40	25 × ·40	26 × ·40	26 × ·40	27 × ·40
	Face Angle	3½ × 3 × ·36	3½ × 3 × ·40	3½ × 3 × ·44	3½ × 3 × ·44	4 × 3 × ·40	4½ × 3 × ·42
18	Web	26 × ·40	27 × ·40	27 × ·40	28 × ·40	28 × ·40	29 × ·40
	Face Angle	4 × 3 × ·44	4 × 3 × ·50	4½ × 3 × ·50	5 × 3 × ·50	5½ × 3 × ·50	6 × 3½ × ·48
20	Web	29 × ·40	30 × ·40	30 × ·40	31 × ·40	31 × ·40	32 × ·40
	Face Angle	5½ × 3 × ·46	5½ × 3½ × ·48	5½ × 3½ × ·50	6 × 3½ × ·50	6½ × 3½ × ·50	6½ × 3½ × ·56
22	Web	31 × ·40	32 × ·40	32 × ·40	33 × ·42	33 × ·42	34 × ·42
	Face Angle	6½ × 3½ × ·50	6½ × 3½ × ·56	7 × 3½ × ·56	4 × 3½ × ·42	4 × 3½ × ·44	4½ × 3½ × ·46
24	Web	33 × ·42	34 × ·42	35 × ·42	36 × ·42	36 × ·42	37 × ·42
	Double Face Angles	3½ × 3½ × ·46	4 × 3½ × ·48	4 × 3½ × ·48	4 × 3½ × ·50	4½ × 3½ × ·48	5 × 3½ × ·50
26	Web	35 × ·42	36 × ·42	37 × ·42	38 × ·44	38 × ·44	39 × ·44
	Double Face Angles	5 × 3½ × ·46	5 × 3½ × ·50	5 × 3½ × ·52	5½ × 3½ × ·50	6 × 3½ × ·50	6½ × 3½ × ·52
28	Web	37 × ·42	38 × ·44	39 × ·44	40 × ·44	40 × ·44	41 × ·44
	Double Face Angles	6 × 3½ × ·50	6½ × 3½ × ·50	6½ × 3½ × ·52	7 × 3½ × ·52	7 × 3½ × ·56	7 × 3½ × ·54
30	Web	39 × ·44	40 × ·44	41 × ·44	42 × ·46	42 × ·46	43 × ·46
	Double Face Angles	7 × 3½ × ·52	7 × 3½ × ·50	7 × 3½ × ·54	8 × 3½ × ·50	8 × 3½ × ·52	8 × 3½ × ·58
32	Web	41 × ·44	42 × ·46	43 × ·46	44 × ·46	45 × ·46	46 × ·46
	Double Face Angles	7½ × 3½ × ·52	8 × 3½ × ·54	8 × 3½ × ·56	8 × 3½ × ·58	8½ × 3½ × ·56	9 × 3½ × ·58
34	Web	44 × ·46	45 × ·46	46 × ·46	47 × ·46	48 × ·46	49 × ·48
	Double Face Bulb Angles ..	8 × 3½ × ·56	8½ × 3½ × ·58	8½ × 3½ × ·60	9 × 3½ × ·62	9 × 3½ × ·62	9½ × 3½ × ·62
36	Web	47 × ·46		50 × ·48		51 × ·48	
	Double Face Bulb Angles ..	8½ × 3½ × ·60		9 × 3½ × ·60		10 × 3½ × ·62	

TABLE 25

TRANSVERSE BULKHEADS.

VERTICAL WEBS IN EXPANSION TRUNK.

BREADTH OF SHIP. B	PLATE AND FLANGE.	HEIGHT OF 'TWEEN DECKS IN FEET. 8	10	12.	14	16
Feet. 30	Web	Inches. 16 × ·36	Inches. 17 × ·38			
	Flange	5	5			
40	Web	17 × ·38	18 × ·40	19 × 42		
	Flange	5	5	5		
50	Web	18 × ·40	19 × ·42	20 × 42	21 × 42	22 × 42
	Flange	5	5	4½ × 3½ × 42 2·44	4½ × 3½ × 44	5 × 3½ × 46
60	Web	18 × ·42	20 × ·42	21 × 42	22 × 42	24 × 44
	Flange	5	5	4½ × 3½ 144 3·33	5 × 3½ × 46 3·40	5½ × 3½ × 48 4·09
70	Web	19 × ·42	21 × ·42	22 × 42	24 × 44	24 × 44
	Flange	5	5	5 × 3½ × 46 3·40	5½ × 3½ × 48 4·09	6 × 4 × 50 4·45

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Webs above 20' in depth to have brackets double riveted at each end. Top + Bottom.

HORIZONTAL STIFFENERS on TRANSVERSE BULKHEADS. TABLE 26

DEPTH BELOW UPPER DECK AT CENTRE.		SPAN BETWEEN ADJACENT VERTICAL WEBS.			DEPTH BELOW UPPER DECK AT CENTRE.		SPAN BETWEEN VERTICAL WEB AND SHIP'S SIDE OR BETWEEN VERTICAL WEB AND CENTRE LINE BULKHEAD.		
		Feet. Inches. 7 — 6	Feet. Inches. 8 — 6	Feet. Inches. 9 — 6			Feet. Inches. 9 — 0	Feet. Inches. 10 — 0	Feet. Inches. 11 — 0
Feet.		Inches.	Inches.	Inches.	Feet.		Inches.	Inches.	Inches.
4		6 ×3 ×·36 7.30	6 ×3 ×·38 7.50	6½×3 ×·34 8.35	4		6 ×3 ×·34 7.15	6 ×3 ×·36 7.30	6½×3 ×·40 8.45
6		6 ×3 ×·38 7.50	6 ×3 ×·40 7.65	6½×3 ×·46 9.55	6		6 ×3 ×·36 7.30	6 ×3 ×·46 8.10	7 ×3 ×·36 10.10
8		6 ×3 ×·40 7.65	6½×3 ×·40 8.95	7 ×3 ×·44 11.0	8		6 ×3 ×·40 7.65	6½×3 ×·46 9.55	7 ×3 ×·48 11.40
10		6 ×3 ×·42 7.50	7 ×3 ×·34 9.00	7½×3 ×·42 12.55	10		6½×3 ×·36 8.55	7 ×3 ×·38 10.35	7½×3 ×·42 12.65
12		6½×3 ×·38 8.75	7½×3 ×·36 11.80	8 ×3 ×·40 14.15	12		7 ×3 ×·34 9.90	7½×3 ×·36 11.8	8 ×3 ×·38 13.85
14		7 ×3 ×·38 10.35	7½×3 ×·46 13.05	8½×3 ×·42 16.45	14		7 ×3 ×·42 10.8	7½×3 ×·46 13.05	8½×3 ×·38 15.80
16		7½×3 ×·36 11.80	8 ×3 ×·46 15.00	9 ×3 ×·44 19.20	16		7½×3 ×·36 11.8	8 ×3 ×·42 14.45	8½×3 ×·50 17.4
18		7½×3 ×·46 13.05	8½×3 ×·46 17.05	9½×3½×·44 21.35	18		7½×3 ×·48 13.30	8½×3 ×·38 15.85	9 ×3 ×·46 19.55
20		8 ×3 ×·44 14.70	9 ×3 ×·44 19.20	10 ×3½×·46 24.35	20		8 ×3 ×·40 14.15	8½×3 ×·50 17.4	9½×3½×·46 21.85
22		8½×3 ×·40 16.15	9½×3½×·44 21.35	10 ×3½×·52 25.50	22		8 ×3 ×·48 15.25	9 ×3 ×·44 19.20	9½×3½×·52 23.20
24		8½×3 ×·50 17.40	9½×3½×·50 22.75	10½×3½×·50 28.5	24		8½×3 ×·40 16.15	9½×3½×·46 21.85	10 ×3½×·46 24.35
26		9 ×3 ×·44 19.20	10 ×3½×·46 24.35	11 ×3½×·48 30.9	26		8½×3 ×·50 17.40	9½×3½×·48 22.30	10 ×3½×·54 26.30
28		9½×3½×·44 21.35	10½×3½×·46 27.5	11 ×3½×·56 32.9	28		9 ×3 ×·44 19.20	9½×3½×·52 23.20	10½×3½×·46 27.5
30		9½×3½×·46 21.85	10½×3½×·48 28.0	11½×3½×·52 35.3	30		9 ×3 ×·46 19.55	10 ×3½×·46 24.35	10½×3½×·54 28.5
32		10 ×3½×·46 24.35	11 ×3½×·48 30.9	12 ×3½×·50 37.4	32		9½×3½×·44 21.35	10 ×3½×·50 25.35	11 ×3½×·48 30.9
34		10½×3½×·48 28.0	11 ×3½×·52 31.9	12 ×3½×·58 40.0	34		9½×3½×·46 21.85	10½×3½×·48 28.00	11 ×3½×·54 33.4
36		10½×3½×·54 29.5	11½×3½×·50 34.4	12 ×3½×·66 42.1	36		9½×3½×·50 22.45	10½×3½×·50 28.5	11½×3½×·50 34.4

BULB ANGLES

STIFFENERS to TRANSVERSE BULKHEADS in SUMMER TANKS.

VERTICAL STIFFENERS. TABLE 27

HEIGHT OF 'TWEEN DECKS.	SIZE OF STIFFENER.	RIVETS IN BRACKETS AT SECOND DECK.	
		Number.	Diameter.
Feet.	Inches, Bulb Angles.		Inches.
8	6 × 3 × ·36 7·30	4	$\frac{7}{8}$
10	$6\frac{1}{2}$ × 3 × ·36 8·55	5	$\frac{7}{8}$
12·	7½· 3· 36	6	7/8
14	8½· 3·44 16 75	7	7/8
16	10 · 3½· 50 25·35	8	7/8·

HORIZONTAL STIFFENERS.

OVERALL SPAN. 8	DISTANCE BELOW DECK IN FEET.				
	2·5 5½· 3· 33 5·85	5·0 6 90	7·5 8·65	10· 0 10·60	12· 5 12·
Feet.	Inches, Bulb Angles.	Inches, Bulb Angles.	Inches, Bulb Angles.		
10	6 × 3 × ·36 7.30	$6\frac{1}{2}$ × 3 × ·38 8·75	7 × 3 × ·40 10·6	7× 3×·42 12.55	8× 3·44 14·2
12	$6\frac{1}{2}$ × 3 × ·38 8·75	7 × 3 × ·40 10.60	$7\frac{1}{2}$ × 3 × ·42 12 55	8½· 3· 44	9½· 3½· 44 21·3
14	7 × 3 × ·40 10·60	$7\frac{1}{2}$ × 3 × ·40 12·30	9 × 3 × ·40 18·50	10 × 3½· 46 24·85	11 × 3½· 48 30.9
16	$7\frac{1}{2}$ × 3 × ·40 12·30	$8\frac{1}{2}$ × 3 × ·40 16·15	10 × 3½ × ·44 23·85	11 × 3½· 48 30.9	12 · 3½ · 66 42.1
18	8 × 3 × ·40 14·15	9 × 3 × ·44 19.20	11 × 3½ × ·50 31·4	12· 3½· 66	

above 11·0" webs to be same as side transverses in Tween Decks

WEBS in 'TWEEN DECKS at CENTRE LINE BULKHEAD and EXPANSION TRUNK. TABLE 28

DEPTH OF 'TWEEN DECK AT CENTRE.	WEB.	SPACING IN FEET.					
		7	8	9	10	11	12
Feet.		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
8	Breadth	16—22	18—24	20—26	22—28	23—29	24—30
	Thickness	·38	·40	·40	·40	·40	·40
	Flange on Edge	5	5	5	5	5	5
9	Breadth	18—24	20—26	22—28	23—29	24—30	25—31
	Thickness	·40	·40	·40	·40	·40	·40
	Flange on Edge	5	5	5	5	5	5
10	Breadth		22—28	23—29	24—30	25—31	
	Thickness		·40	·40	·40	·40	
	Flange on Edge		5	5	5	5	

23·29 24·30 25·31 26·32.
Breadth. ·40 ·40 ·40 ·40
Thickness. 5 5 5 5
Flange.

HORIZONTAL STIFFENERS to CENTRE LINE BULKHEAD. TABLE 29

WHERE MORE THAN ONE TRANSVERSE IS FITTED IN EACH TANK.					WHERE ONE TRANSVERSE ONLY IS FITTED IN EACH TANK.				
DEPTH BELOW UPPER DECK AT CENTRE.		SPAN IN FEET.			DEPTH BELOW UPPER DECK AT CENTRE.		SPAN IN FEET.		
		8	9	10			10	11	12
Feet.		Inches.	Inches.	Inches.	Feet.		Inches.	Inches.	Inches.
2	^	6 ×3 ×·34 7.15	6½×3 ×·38 8.75	7 ×3 ×·40 10.60	2	^	6½×3 ×·38 8.75	7 ×3 ×·40 10.60	7½×3 ×·40 12.30
4		6 ×3 ×·34 7.15	6½×3 ×·38 8.75	7 ×3 ×·40 10.60	4		6½×3 ×·38 8.75	7 ×3 ×·40 10.60	7½×3 ×·40 12.30
6		6 ×3 ×·34 7.15	6½×3 ×·38 8.75	7 ×3 ×·40 10.60	6		6½×3 ×·38 8.75	7 ×3 ×·40 10.60	7½×3 ×·40 12.30
8		6 ×3 ×·38 7.60	7 ×3 ×·38 10.35	7½×3 ×·40 12.30	8		7 ×3 ×·38 10.35	7½×3 ×·40 12.30	8 ×3 ×·40 14.15
10		6½×3 ×·38 8.75	7 ×3 ×·44 11.00	7½×3 ×·50 13.50	10		7 ×3 ×·42 10.80	7½×3 ×·46 13.05	8 ×3 ×·46 15.0
12		6½×3 ×·42 9.15	7 ×3 ×·50 11.65	8 ×3 ×·44 14.70	12		7 ×3 ×·48 11.40	8 ×3 ×·42 14.45	8½×3 ×·46 17.05
14		7 ×3 ×·42 10.80	7½×3 ×·50 13.50	8½×3 ×·44 16.75	14		7½×3 ×·46 13.05	8 ×3 ×·52 15.45	9 ×3 ×·46 19.55
16		7½×3 ×·40 12.30	8 ×3 ×·38 13.85	9 ×3 ×·44 19.20	16		8 ×3 ×·44 14.70	8½×3 ×·52 18.0	9½×3½×·48 22.30
18		7½×3 ×·48 13.30	8½×3 ×·44 16.75	9 ×3½×·52 20.56	18		8 ×3 ×·50 15.50	9 ×3 ×·48 19.85	9½×3½×·56 24.05
20		8 ×3 ×·42 14.45	8½×3 ×·50 17.4	9½×3½×·48 22.3	20		8½×3 ×·46 17.05	9 ×3 ×·56 21.2	10 ×3½×·52 26.8
22		8 ×3 ×·48 15.25	9 ×3 ×·46 19.55	9½×3½×·56 24.05	22		9 ×3 ×·44 19.20	9½×3½×·52 23.20	10 ×3½×·60 27.4
24		8½×3 ×·44 16.75	9½×3½×·46 21.85	10 ×3½×·54 26.30	24		9 ×3½×·50 20.20	10 ×3½×·50 25.35	10½×3½×·58 30.5
26		8½×3 ×·50 17.70	9½×3½×·50 22.75	10 ×3½×·58 27.25	26		9½×3½×·46 21.65	10 ×3½×·54 26.30	11 ×3½×·52 31.9
28		9 ×3 ×·42 18.85	9½×3½×·54 23.65	10½×3½×·52 29.00	28		9½×3½×·50 22.75	10 ×3½×·60 27.7	11 ×3½×·58 33.4
30		9 ×3 ×·46 19.55	10 ×3½×·50 25.35	10½×3½×·58 30.50	30		9½×3½×·54 23.65	10½×3½×·54 29.5	11½×3½×·52 35.3
32		9½×3½×·44 21.35	10 ×3½×·54 26.30	11 ×3½×·54 32.4	32		10 ×3½×·50 25.35	10½×3½×·60 31.0	11½×3½×·60 37.3
34		9½×3½×·48 22.30	10 ×3½×·58 27.25	11 ×3½×·58 33.40	34		10 ×3½×·54 26.30	11 ×3½×·54 32.4	12 ×3½×·52 38.3
36		9½×3½×·52 23.2	10 ×3½×·60 27.4	11 ×3½×·62 34.3	36		10 ×3½×·56 26.45	11 ×3½×·58 33.4	12 ×3½×·56 39.5
38		9½×3½×·56 24.05	10½×3½×·54 24.15	11½×3½×·56 34.3	38		10 ×3½×·60 27.4	11 ×3½×·62 34.3	12 ×3½×·66 42.10
40		9½×3½×·58 24.4	10½×3½×·60 31.0	12 ×3½×·52 28.3	40		10½×3½×·54 29.5	11½×3½×·56 36.3	12×3½×3½×·54 44.6
42		10 ×3½×·52 25.8	11 ×3½×·54 32.4	12 ×3½×·58 40.0	42		10½×3½×·58 30.5	11½×3½×·62 34.8	12×3½×3½×·58 46.2
44		10 ×3½×·56 26.75	11 ×3½×·60 33.4	12 ×3½×·66 42.1	44		11 ×3½×·54 32.4	12 ×3½×·58 40.0	12×4 ×4 ×·54 48.5
46	v	10 ×3½×·62 28.10	11½×3½×·52 35.3	12×3½×3½×·52 43.8	46	v	11 ×3½×·60 33.4	12 ×3½×·64 41.6	12×4 ×4 ×·60 50.9

RIVETING of END LAPS. TABLE 30

		Not exceeding ·36	Above ·36 and not exceeding ·38	Above ·38 and not exceeding ·42	Above ·42 and not exceeding ·48	Above ·48 and not exceeding ·54	Above ·54 and not exceeding ·60	Above ·60 and not exceeding ·68	Above ·68 and not exceeding ·76	Above ·76 and not exceeding ·84	Above ·84 and not exceeding ·94	Above ·94 and not exceeding 1·04	Above 1·04 and not exceeding 1·26
KEEL	½ L. Amids. ..					Treble	Treble	Quadruple	Quadruple	Quadruple	Double Straps Treble Riveted	Double Straps Treble Riveted	Double Straps Treble Riveted
	Ends					Treble	Treble	Treble	Treble	Quadruple	Quadruple		
BOTTOM SHELL	½ L. Amids. ..			Treble	Treble	Treble	Quadruple	Quadruple	Double Straps Treble Riveted	Double Straps Treble Riveted			
	Ends		Double	Double	Treble	Treble	Treble	Treble	Quad				
SIDE SHELL	½ L. Amids. ..			Double	Treble	Treble	Treble	Quadruple	Quadruple				
	Ends		Double	Double	Treble	Treble	Treble	Treble	Quad				
STRAKE BELOW SHEERSTRAKE	½ L. Amids. ..			Treble	Treble	Treble	Treble	Quadruple	Quadruple	Quadruple	Double Straps Treble Riveted	Double Straps Treble Riveted	
	Ends			Double	Treble	Treble	Treble	Treble	Quad				
SHEERSTRAKE	½ L. Amids. ..			Treble	Treble	Treble	Treble	Quadruple	Quadruple	Quadruple	Double Straps Treble Riveted	Double Straps Treble Riveted	Double Straps Treble Riveted
	Ends			Double	Treble	Treble	Treble	Treble	Quad				
UPPER DECK STRINGER	½ L. Amids..			Treble	Treble	Treble	Treble	Quadruple	Quadruple	Quadruple	Double Straps Treble Riveted	Double Straps Treble Riveted	
	Ends			Double	Treble	Treble	Treble	Treble	Quad				
UPPER DECK PLATING	½ L. Amids..	Double	Double	Double	Double	Treble	Treble	Treble	Quadruple	Quadruple	Quadruple		
SECOND DECK PLATING	½ L. Amids..	Double	Double	Double	Double	Treble							
SECOND DECK STRINGER	½ L. Amids..	Double	Double	Double	Treble	Treble							

PROVING ESTABLISHMENTS.

The following Proving Establishments are recognised by the Committee of Lloyd's Register for the Testing of Anchors and Chains while licensed by the Board of Trade for that purpose :—

Netherton (near Dudley)—Lloyd's Proving House	Superintendent,	Mr. H. Green.
Tipton—Lloyd's Proving House	ditto	Mr. W. A. Drysdale.
Low Walker-on-Tyne—Lloyd's Proving House	ditto	Mr. A. Green.
Chester (Saltney)—Lloyd's Proving House	ditto	Mr. J. R. Parsons.
Glasgow—Lloyd's Proving House	ditto	Mr. L. Haffner.
Cardiff—Lloyd's Proving House	ditto	Mr. L. L. Wright.
Sunderland—Lloyd's Proving House	ditto	Mr. J. H. Butler.
Cradley Heath—Lloyd's Proving House	ditto	Mr. S. C. Paul.

The following Machines have been recognised by the Committee for the testing of Anchors and Chain Cables supplied to vessels of other than British Registry (*see* Section 40 of the Rules for Steel Vessels) :—

Australia	Bloomers Chains, Lim., South Brisbane, Queensland.
Austria	F. F. von Helldorff & Otto Rothhart, Brückl-Kärnten.
Belgium	Antwerp Engineering Co., Société Anonyme, Rue des Indes, Antwerp.
„	Demaret (Edmond) & Cie.—Société en commandite simple, Heppignies, near Fleurus.
„	Société Anonyme de Clouteries Mécaniques, Fontaine l'Evêque (for the testing of small Chains only).
„	Société Anonyme des Forges de Courcelles—Centre, Courcelles (for testing Chains up to 52 tons.)
„	Société Anonyme des Usines Wattelar-Francq., Jumet.
Canada	Thos. Davidson Manufacturing Co., Lim., Turcot, Montreal.
„	Dominion Chain Co., Lim., Niagara Falls, Ontario.
„	McKinnon-Columbus Chain, Lim., St. Catherine's, Ontario.
Czecho-Slovakia	Berg-und Hüttenwerks-Gesellschaft, Brno, Maly Moravka (for testing chains up to 50 tons).
„	Voigtmann & Söhne, Janowitz, near Römerstadt, Mähren.
Danzig	International Shipbuilding and Engineering Co., Lim.
Denmark	Government Establishment at Copenhagen.
France	Ateliers & Chantiers Maritimes du Sud Ouest, Bordeaux.
„	Bievelot & Co., Havre.
„	Chaineries de Saint-Nazaire, Saint Nazaire.
„	Chantiers de la Loire, Nantes.
„	Davaine (H.), Fils et Cie, St. Amand-les-Eaux (Nord).
„	E. Turbot, Anzin (Nord).
„	Etablissement Sirot-Mestreít, Saint Amand-les-Eaux (Nord).
„	Forges de la Chaussade, Guérigny (Nièvre).
„	Marit, Isidore, Raismes (Nord).
„	Paoli (J.) & Co., Marseilles.
France (*Cont.*)	Société Anonyme des Chaineries de St. Amand-les-Eaux, Etablissements Dorémieux fils & Cie. E. Quinet, St. Amand-les-Eaux (Nord).
„	Société Anonyme des Chaineries, Tolerie et Chaudronnerie Amandinoises, St. Amand-les-Eaux (Nord).
„	Société Nouvelle des Forges & Chaineries du Nord, St. Amand-les-Eaux (Nord).
„	Veille & Co., Havre.
„	Ziegler Frères, Dunkirk.
Germany	A. Borsig, Berg und Hüttenverwaltung Borsigwerk, Borsigwerk, Upper Silesia.
„	Deutsch-Luxemburgische Bergwerks und Hütten Aktiengesellschaft. Dortmunder Union, Dortmund (for the testing of Anchors only). Carl Schlieper, Grüne, Westphalia ; also Sichtigvor, Westphalia.
„	Deutsche Maschinenfabrik A. G., Duisburg.
„	Gutehoffnungshütte A. G., Sterkrade.
„	Hansa Kettenfabrik, Haunschild & Co., Dortmund.
„	D'Hone, Ruthen, Westphalia.
„	Marinewerft, Wilhelmshaven.
„	Otto Gruson & Co., Magdeburg (for the testing of Anchors only).
„	Stülcken (H. C.) Sohn, Schiffswerft und Maschinenfabrik, Hamburg.
„	Theile (J.D.), Schwerte, Westphalia.
Holland	Amsterdamsche Droogdok Maatschappij, Amsterdam.
„	Koninklijke Nederlandsche Grofsmederij, Leiden.
„	N. V. Heijermans Anker en Ketting Industrie, Schiedam.
„	N. V. Nederlandsche Ketting & Ankerfabriek Rotterdam.
Italy	Ansaldo, Gio., & Co., Cornigliano Ligure.
„	Catenificio Ing. Carlo Bassoli & Co., Leghorn.
„	Direzione Costruzioni Navali dell'Arsenale, Pola (approved for loads 50 tons upwards).
„	Laminatojo Arlenico, Lecco.

ITALY (*Cont.*)	Regia Marina — Direzione Costruzioni Navali — Laboratorio Sperimentale, Regio Arsenale, Spezia.
„	Società Anonima Acciaierie Weissenfels— Fusine in Valromana, Friuli (for the testing of small Chains only).
JAPAN	Kaiji Kyokai Proving House (Japan Lloyd's), Yokohama.
„	Kobe Steel Works, Kobe (for the testing of Anchors only).
„	Mitsu Bishi Dockyard & Engine Works, Nagasaki.
„	Nippon Mechanical Chain Works, Lim., Osaka.
„	Osaka Chain Works, Lim., Osaka.
„	Osaka Chain Works, Yokohama.
„	Oshima Steel Works, Oshima, Tokio (for the testing of Anchors only).
NORWAY	A/S Kjaettingfabriken, Oslo (for testing Chains up to 30 tons).
„	Aktieselskabet Starkad, Moss.
„	Royal Naval Dockyard, Horten.
SWEDEN	Ljusne Chain Works (Ljusne Kätting-fabrik), Ljusne.
„	Ramnäs Bruks Aktiebolag, Ramnäs.
„	Statens Profningsanstalt (Government Establishment), Stockholm.
„	Tonshammars Bruks Nya Aktiebolag, Sandarne.
UNITED STATES	American Chain Co., Columbus, Ohio, and Braddock, near Pittsburgh, Pa.
„ „	American Steel Casting Co., Chester, Pa. (for the testing of Anchors only).
„ „	Bellingham Chain & Forge Co., South Bellingham, Wash.
„ „	Bradlee & Co.'s Works, Philadelphia, Pa.
UNITED STATES (*Cont.*)	Buckeye Steel Castings Co., Columbus, Ohio (for breaking tests on Chain Cables only).
„ „	Carr Chain Works, Inc., Troy, N.Y.
„ „	Carroll Chain Co., Columbus, Ohio.
„ „	Cleveland Steel Casting Co., Cleveland, Ohio (for the testing of Anchors only).
„ „	Columbia Steel Co., Lim., Pittsburgh, Cal. (for the testing of Anchors only).
„ „	Columbus McKinnon Chain Co., Columbus, Ohio, and Lebanon, Pa.
„ „	Frankford Chain Works, Frankford, Philadelphia, Pa.
„ „	Herreshoff Manufacturing Co., Bristol, R.I. (for the testing of Anchors only).
„ „	Johnson-Farmer Chain Co., Lebanon, Pa.
„ „	Jones & Laughlin Steel Co., Pittsburgh, Pa.
„ „	Knoxville Iron Co., Knoxville, Tenn.
„ „	The Logan Iron and Steel Co., Burnham, Pa.
„ „	National Malleable Castings Co., Cleveland, Ohio, and Sharon, Pa.
„ „	Penn Seaboard Steel Corporation, Chester, Pa. (for the testing of Anchors only).
„ „	Portland Chain Manufacturing Co., Portland, Or.
„ „	Seattle Chain Co., 6921, East Marginal Way, Seattle, Wash.
„ „	Seneca Chain Co., Kent, Ohio.
„ „	Taylor (S.G.) Chain Company, Hammond, Indiana.
„ „	United States Chain & Forging Co., Pittsburgh, Pa.
„ „	Weimer Chain & Iron Co., Lebanon, Pa.
„ „	Whitehill Chain Works, Whitehill, Fieldsboro, N.J.
„ „	Woodhouse Chain Works, Trenton, N.J.

N.B.—Vessels supplied with Anchors and Chain Cables tested at any of the Establishments in the foregoing lists will have the notation of "Lloyd's A.&.C.P." in the Register Book, provided that in the case of machines outside Great Britain and Ireland the tests are carried out under the supervision of a Surveyor to the Society.

By order of the Committee,

ANDREW SCOTT,

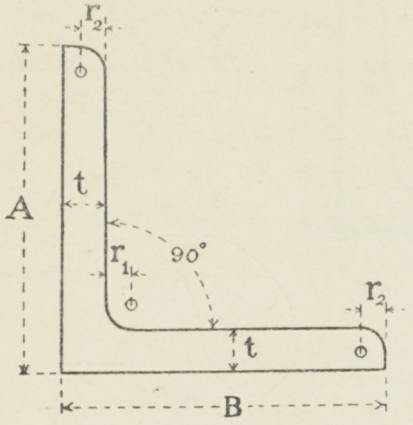
Secretary.

LONDON.—*July*, 1930.

BRITISH STANDARD SECTIONS.

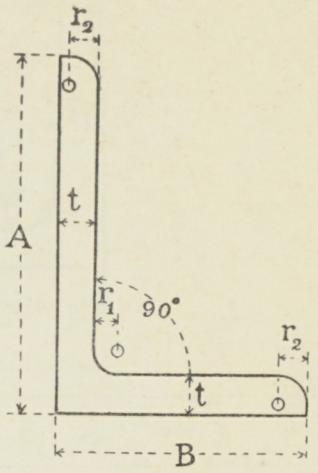
LONDON.—*Revised July, 1920.*

EQUAL ANGLES.



Size.	Thickness at Correct Standard Profile.			Minimum thickness rolled.	Maximum thickness rolled.	Radii.	
A × B	Minimum.	Mean.	Maximum.			Root.	Toe.
	t	t	t			r_1	r_2
Inches.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
$\frac{3}{4} \times \frac{3}{4}$	·125	—	·250	·125	·250	·17	·12
1 × 1	·125	—	·250	·125	·300	·18	·13
$1\frac{1}{4} \times 1\frac{1}{4}$	·125	—	·250	·125	·300	·20	·14
$1\frac{1}{2} \times 1\frac{1}{2}$	·125	—	·250	·125	·350	·21	·15
$1\frac{3}{4} \times 1\frac{3}{4}$	·175	—	·300	·175	·375	·23	·16
2 × 2	·175	—	·300	·175	·400	·24	·17
$2\frac{1}{4} \times 2\frac{1}{4}$	·175	—	·300	·175	·450	·26	·18
$2\frac{1}{2} \times 2\frac{1}{2}$	·250	·375	·500	·200	·500	·27	·19
$2\frac{3}{4} \times 2\frac{3}{4}$	·250	·375	·500	·225	·525	·29	·20
3 × 3	·250	·375	·500	·250	·525	·30	·21
$3\frac{1}{2} \times 3\frac{1}{2}$	·300	·425	·500	·275	·575	·33	·23
4 × 4	·300	·425	·500	·300	·625	·36	·25
5 × 5	·375	—	·500	·350	·700	·42	·29
6 × 6	·450	—	·625	·425	·775	·48	·34
8 × 8	·550	—	·750	·550	·950	·60	·42
9 × 9	·550	—	·750	·550	1·000	·66	·46

UNEQUAL ANGLES.

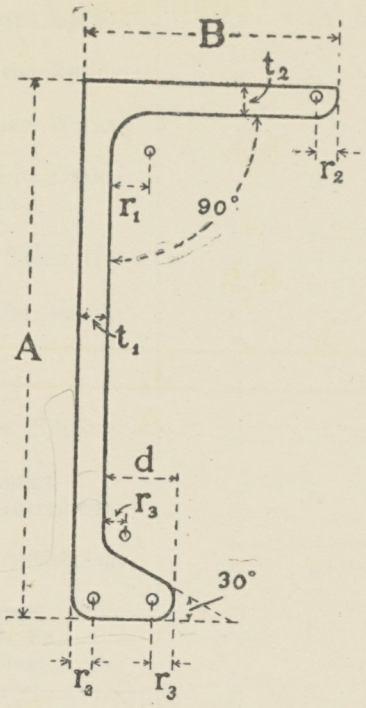


Size.	Thickness at Correct Standard Profile.			Minimum thickness rolled.	Maximum thickness rolled.	Radii.	
A × B	Minimum.	Mean.	Maximum.			Root.	Toe.
	t	t	t			r_1	r_2
Inches.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
2 × $1\frac{1}{2}$	·175	—	·300	·150	·375	·23	·16
$2\frac{1}{2} \times 1\frac{1}{2}$	·175	—	·300	·150	·400	·24	·17
$2\frac{1}{2} \times 2$	·175	—	·300	·175	·450	·26	·18
3 × 2	·250	·375	·500	·200	·500	·27	·19
3 × $2\frac{1}{2}$	·250	·375	·500	·225	·525	·29	·20
$3\frac{1}{2} \times 2\frac{1}{2}$	·250	·375	·500	·250	·525	·30	·21
$3\frac{1}{2} \times 3$	·250	·375	·500	·250	·550	·32	·22
4 × 3	·300	·425	·500	·275	·575	·33	·23
4 × $3\frac{1}{2}$	·300	·425	·500	·275	·600	·35	·24
5 × 3	·300	·425	·500	·300	·625	·36	·25
5 × $3\frac{1}{2}$	·375	—	·500	·325	·625	·38	·26
5 × 4	·375	—	·500	·325	·650	·39	·27
6 × 3	·375	—	·500	·325	·650	·39	·27
6 × $3\frac{1}{2}$	·375	—	·500	·350	·675	·41	·29
6 × 4	·375	—	·500	·350	·700	·42	·29
7 × $3\frac{1}{2}$	—	·525	—	·375	·725	·44	·31
8 × 4	—	·625	—	·425	·775	·48	·34
8 × 6	—	·625	—	·450	·800	·54	·38
9 × 4	—	·650	—	·450	·825	·51	·36
10 × 4	—	·675	—	·475	·850	·54	·38

BRITISH STANDARD SECTIONS.

LONDON.—*Revised July, 1920.*

BULB ANGLES.



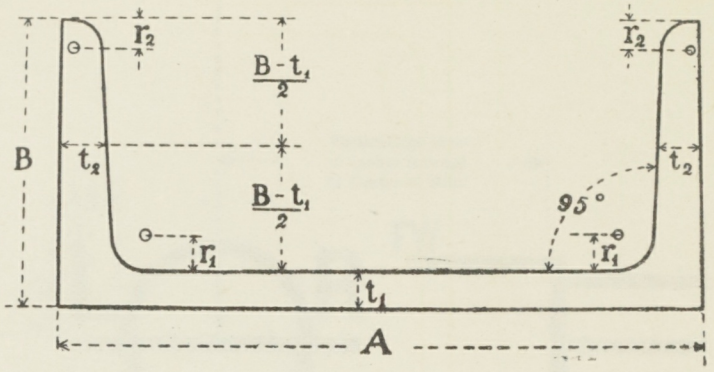
Size.	Thickness at Correct Standard Profile.		Web thickness.		Radii.			d
A × B	Web.	Flange.	Minimum rolled.	Maximum rolled.				
	t_1	t_2			r_1	r_2	r_3	
Inches.	Inch.		Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
4 × 2½	·26		·21	·46	·42	·21	·16	·52
4½ × 2½	·28		·23	·48	·42	·21	·18	58
5 × 2½	·30		·25	·50	·42	·21	·20	·65
5 × 3	·30		·25	·50	·48	·24	·20	·65
5½ × 3	·31		·26	·52	·48	·24	·22	·71
6 × 3	·33		·28	·54	·48	·24	·24	·78
6 × 3½	·33		·28	·54	·54	·27	·24	·78
7 × 3	·38		·33	·59	·48	·24	·28	·91
7 × 3½	·38		·33	·59	·54	·27	·28	·91
8 × 3	·40		·35	·61	·48	·24	·32	1·04
8 × 3½	·40		·35	·61	·54	·27	·32	1·04
9 × 3½	·43		·38	·65	·54	·27	·36	1·17
10 × 3½	·45		·40	·67	·54	·27	·40	1·30
11 × 3½	·48		·43	·70	·54	·27	·44	1·43
12 × 3½	·50		·45	·73	·54	·27	·48	1·56
12 × 4	·50		·45	·73	·60	·30	·48	1·56
13½ × 4	·54		·49	·77	·60	·30	·54	1·75
15 × 4	·57		·52	·82	·60	·30	·60	1·95

Where the thickness of Bulb Angle is greater than the Standard thickness, the flange and web will not be of the same thickness; generally for each ·05 inch increase in the thickness of the web the thickness of the flange will be increased ·025 inch.

BRITISH STANDARD SECTIONS.

LONDON.—*Revised July, 1920.*

CHANNELS.



Size.	Thickness at Correct Standard Profile.		Web thickness.	Radii.	
Web and Flanges.	Web.	Flange.	Minimum rolled.	Root.	Toe.
A × B	t_1	t_2		r_1	r_2
Inches.	Inch.	Inch.	Inch.	Inch.	Inch.
3 × 1½	·20	·28	·20	·30	·15
4 × 2	·24	·31	·24	·36	·18
5 × 2½	·25	·38	·25	·42	·21
6 × 3	·25	·38	·25	·48	·24
6 × 3½	·28	·48	·28	·54	·27
7 × 3	·26	·42	·26	·48	·24
7 × 3½	·30	·50	·30	·54	·27
8 × 3	·28	·44	·28	·48	·24
8 × 3½	·32	·52	·32	·54	·27
9 × 3	·30	·44	·30	·48	·24
9 × 3½	·34	·54	·34	·54	·27
10 × 3	·32	·45	·32	·48	·24
10 × 3½	·36	·56	·36	·54	·27
12 × 3½	·35	·50	·35	·54	·27
12 × 3½	·40	·60	·40	·54	·27
12 × 4	·40	·60	·40	·60	·30
15 × 4	·41	·62	·41	·60	·30
17 × 4	·48	·68	·48	·60	·30

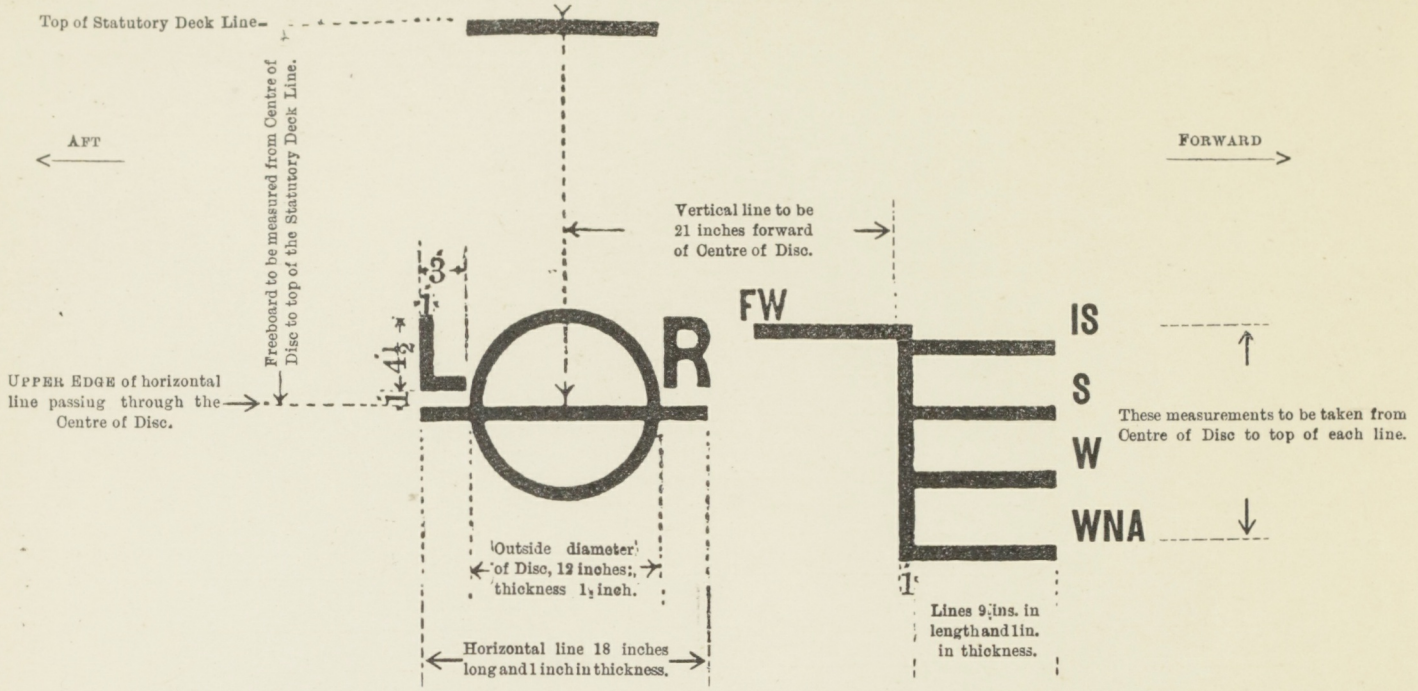
The Standard thickness of flanges of Channel bar is to be measured at distances half way between the extreme edges of the flanges and the inner side of the web.

The web of Channel bars can be increased beyond the Table thickness but the thickness of flanges remains constant.

ASSIGNMENT OF FREEBOARD.

The Committee of Lloyd's Register are empowered to assign freeboards to British Vessels and to vessels registered in other countries. Forms of application for the assignment of freeboard can be obtained from the London, or other, offices of the Society.

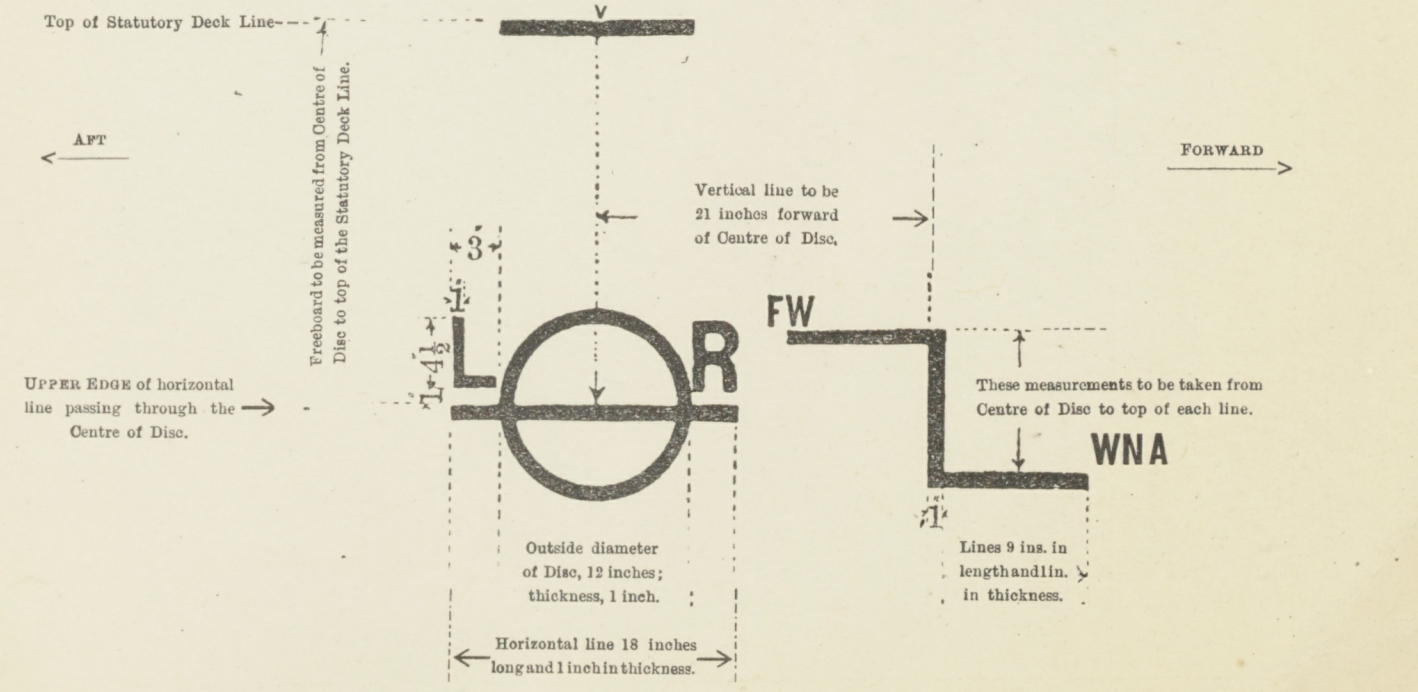
FREEBOARD MARKING FOR STEAMERS.



The Centre of Disc to be placed on both sides of vessel amidships, *i.e.*, at the middle of the length of the load water line. Vessels are to be marked with such of the horizontal lines as are applicable to the nature of their employment. In accordance with the Regulations made by the Board of Trade, the discs and lines must be permanently marked by centre punch marks or cutting, and the particulars given in the Certificate are to be entered in the official log.

N.B.—It is a condition on which a complete superstructure vessel or a vessel of less scantling than the full scantling standard and intended for other than river or inland water service is classed in the Society's Register Book that the freeboard assigned shall be marked on the vessel's sides as above prescribed. If the vessel proceed to sea with a less freeboard than that approved by the Committee, or if the freeboard mark be placed higher than the position assigned by the Committee, the vessel will be liable to have her class expunged from the Register Book.

FREEBOARD MARKING FOR SAILING VESSELS.



The Centre of Disc to be placed on both sides of vessel amidships, *i.e.*, at the middle of the length of the load line. Coasting vessels are required to be marked with only the maximum load line in fresh water. In accordance with the regulations made by the Board of Trade, the disc and lines must be permanently marked by centre punch marks or cutting, and the particulars given in the Certificate are to be entered in the official log.